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**WHY IS IT DIFFERENT? SPECIFIC CHARACTERISTICS OF THE  
HUNGARIAN BATTERY INDUSTRY: LEGAL BACKGROUND AND  
ENVIRONMENTAL IMPACTS**

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# Why Is It Different? Specific Characteristics of the Hungarian Battery Industry: Legal Background and Environmental Impacts

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# Why Is It Different? Specific Characteristics of the Hungarian Battery Industry: Legal Background and Environmental Impacts<sup>1</sup>

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## ***Abstract***

Based on official documents, the paper addresses in detail, why battery production in Hungary cannot be discussed as if it were in another European country. The costs and risks of Hungarian battery production are high because of its specific characteristics, and if current practices remain unchanged, the environmental, health and social damage it causes will directly outweigh the benefits for the population. Experience has shown that large companies will obtain environmental permits, no matter how unclear certain issues remain. Regulations have not been adjusted to this huge battery industry. And even in cases where rules are appropriate, the centrally-mandated authorities are not only lenient, but even break the rules themselves in the interests of the companies. New government regulations are helping the companies instead of local people or workers. There is also a weakening of transparency and inertia on the part of the authorities in many areas. Overall, the environment and nature protection aspects are not being taken into account in this area.

**JEL:** O25, P28, Q25, Q58

**Keywords:** battery production, environmental protection, electric car, automotive industry

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*“Whenever plans are made to undertake a project involving significant changes in the environment or high levels of contamination, one raises the hopes of the people of that area by speaking of the local progress that it will be able to generate. Yet in reality there does not seem to be any true interest in the future of these people, since they are not clearly told that the project will result in the clearing of their lands, a decline in the quality of their lives, a desolate and less habitable landscape lacking in life, the joy of community and hope for the future; in addition to the global damage that eventually compromises many other people as well.”*

*Pope Francis: Laudate Deum, 29.*

## **Introduction**

Several articles on the domestic battery industry have been published in Hungarian journals. Gyórfy (2023a) approached the topic from the perspective of the regulation of battery waste, Czirfusz (2023) from the perspective of the development of wages, and Mihályi (2024) from the perspective of value chain theory. The Hungarian government aims to build 300 GWh of battery production capacity by 2030, more than three times the current capacity within a short timeframe<sup>3</sup> to make Hungary the second major player in the world in this field (although this will depend on the development speed of other countries too). Previously, one of the first analyses on the subject was an article by Gyórfy (2023b), which compared the forced Hungarian battery industry with Swedish practices. The present paper aims to contribute to this latter idea by pointing out why battery production in Hungary cannot be discussed in the same way as in other European countries (Gyórfy, 2024).

My contention is that the Hungarian forced battery production has several characteristics that make its costs and risks high and its impact on nature harmful. The subject of this article is not *why* the Hungarian government is forcing the development of this industry, but *how*. There are, of course, polluting or non-compliant companies operating in Western Europe too, with strong lobbying and there are citizen-initiated lawsuits too. At the same time, the political system (democracy or autocracy) influences the legislation, its monitoring, the possibility of litigation and the outcome of lawsuits. The differences in Hungary compared to other EU Member States can be traced back to a single factor: the existence or lack of the rule of law, checks and balances. To the outside observer, what goes on behind the democratic façade in the practice of state capitalism is not apparent (Ricz, 2021). From abroad, the growing production of batteries, which are

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<sup>3</sup> <https://hipa.hu/szektor/akkumulator/>

presented as a green future, is not necessarily problematic. However, diving into the details, it becomes clear that the Hungarian system of illiberal, hybrid electoral autocracy (with a one-man final decision) does not allow for the fair development of such a large industry. From this point of view, no matter how much value is added, how GDP and exports grow, the environmental, health and social damage caused is more serious than the benefits for certain interest groups.

The methodology of the article is based on the evaluation of official documents (impact assessments, study materials, decisions, laws), scientific articles and press reports, as well as on information from interviews with experts and NGOs. The first part of the study deals with the preparation, permitting and environmental impacts of investments, while the second part analyses industrial safety, risks, government communication and civil society management.

## **The EU background**

Battery production is a priority for the EU. In 2019 and 2021, the European Commission has decided to support several countries with €3-3 billion in IPCEI (Important Project of Common European Interest) funding for the research and development of the pan-European battery value chain. In Central Europe, Poland and Slovakia have received funding. The EU regulation for all types of batteries,<sup>4</sup> which sets strict quality and durability requirements for the life cycle of electric car batteries, came into force in August 2023. All batteries must be fitted with a QR code and information on the battery's key characteristics. The most important provisions for manufacturers are the due diligence requirement and the principle of extended producer responsibility. Quantified recycling targets are also included in the regulation (Gyórfy, 2023).

The EU also wants to support the extraction of critical raw materials, which is why several countries (Spain, Portugal, Czech Republic, Austria, Serbia, Bosnia) have explored lithium deposits. The opening of lithium mines is not generally supported by the public, and in some cases the civil movement has been blocking the start of extraction for eight years (Cáceres, Spain). Battery factories are also being set up in several EU countries, with LG of Korea being the leading producer in Poland, and Northvolt of Sweden building significant European capacity. In some places Chinese capital is being brought in and a Chinese factory is being set up (eg Envision), but the priority for the EU institutions is to develop batteries in-house and to establish some kind of European value chain. According to a recent report, 55% of the announced investments in the battery industry in Europe

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<sup>4</sup> Regulation (EU) No 2023/1542 of the European Parliament and of the Council of 12 July 2023 on batteries and accumulators and waste batteries and accumulators, amending Directive 2008/98/EC and Regulation (EU) No 2019/1020 and repealing Directive 2006/66/EC. OJ L 191, 28.7.2023, P. 1-117.

are European, 23% Chinese and the remainder from South Korean and US companies (Transport & Environment, 2024).

## **Central decisions, preparation of investments**

One might think that the development of a new, major industry would have to be prepared for months (or even years) through a series of consultations (in Spain, for example, maximum consensus is sought even when drafting amendments to the industrial law, with long consultations not only with several industries but also with representatives of regional governments and trade unions). In the present case, we are talking about a sector whose resource requirements would have required considerable, preliminary planning by the Hungarian water, energy and environmental protection sectors. There are no signs of this kind of coordination, only a ministerial strategy paper.

In 2020, the EIT InnoEnergy Scandinavia was commissioned by the then Ministry of Innovation and Technology to prepare an 80-page strategic background paper in English with the involvement of Hungarian experts.<sup>5</sup> The adoption of the "National Battery Industry Strategy 2030", which was translated into Hungarian, was approved by Government Decision 1766/2021 (X. 29.),<sup>6</sup> but the strategy was only published on the Ministry's website a year later, in September 2022.<sup>7</sup> The document listed the following six main objectives: 1. decarbonisation, 2. competitive value chain, 3. strong Hungarian R&D&I, 4. ensuring a skilled workforce, 5. sustainable circular raw materials, 6. strengthening international cooperation. (Practice shows that these objectives have not been achieved.) Labour protection is not included in the document, and environmental protection is only mentioned indirectly through the concept of circular economy. The strategy is described as having been developed with the participation of the main players in the battery value chain at the time: the South Korean factories, energy and electricity suppliers, but not with the participation of environmental or water experts. Nor is it known whether an economic cost-benefit and safety risk analysis was carried out.

Act LIII of 1995 on the General Rules for the Protection of the Environment (Articles 43-44) stipulates that "the preparer of concepts of national and regional importance shall examine and assess the environmental impact of the measure and summarise it in an assessment analysis." No plan or programme "likely to have significant effects on the environment" may be submitted without an environmental assessment. The rules for such an environmental assessment and its mandatory publication are laid down in Government Decree 2/2005 (I. 11.) on the environmental assessment of certain plans and

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<sup>5</sup> [https://hungarianbatteryday.hu/wp-content/uploads/2021/09/InnoEnergy\\_Reference\\_Strategy\\_Final.pdf](https://hungarianbatteryday.hu/wp-content/uploads/2021/09/InnoEnergy_Reference_Strategy_Final.pdf)

<sup>6</sup> Government Decision 1766/2021 (X. 29.) on the adoption of the National Battery Industry Strategy 2030.

<sup>7</sup> <https://kormany.hu/dokumentumtar/nemzeti-akkumulator-iparagi-strategia-2030>

programmes, which is also required by an EU Directive.<sup>8</sup> However, no such strategic environmental assessment has been carried out.

The Hungarian government also classifies major battery manufacturing plants as priority investments of national economic importance, with fast-track approval. (The possibility for such priority investments was created by law in 2006, amended more than 50 times after 2010, and repealed in 2023. Currently, the law on architecture regulates the material and procedural rules for priority investments,<sup>9</sup> (the number of priority projects is now around three thousand). In Spain, for example, in March 2023, the regional government of Extremadura approved the construction of a 50 GWh lithium-ion battery plant by the Chinese Envision in Navalmoral de la Mata as a project of general and regional interest (PREMIA), which allows for accelerated procedures and easier approval of applications. However, in Spain there are only a few such projects (for example, four in Extremadura) and each region regulates the conditions for priority projects itself.

In Hungary, the decision on where to locate battery factories was taken centrally, often without the involvement of local mayors (this was the case in Ivánca and Mikepércs). According to the mayor of Ivánca on 1 February 2021, "On Thursday afternoon I was informed by phone that the SK Innovation group had chosen Hungary, including Ivánca, from several possible countries. This was the basis for Friday's announcement...".<sup>10</sup>

How did these processes work in the case of Northvolt in Sweden? This company was founded in 2016 and made a public decision to create a battery cell factory with a capacity of 60 GWh. Forty municipalities competed for the site of the factory (Henriksson & Weidman Grunewald, 2020). The town of *Skellefteå* in northern Sweden spent a year preparing the plan, involving local energy, water, construction experts, companies and residents, planning the route of the pipelines, the future workers' homes, social facilities and finally having their plan accepted.<sup>11</sup> The battery factory, which will run exclusively on green energy, will be operational in 2022.

Battery investments in Hungary are generally greenfield. In many cases, the investments damage land that is ideal for agricultural production. In Hungary, 80-110 million cubic metres of soil are lost every year, while it can take up to a thousand years for a 2-3 cm layer of topsoil to form.<sup>12</sup> The largest battery project in Debrecen is being carried out by CATL in China, covering 240 hectares, removing and landfilling 280 174

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<sup>8</sup> Directive 2001/42/EC of the European Parliament and of the Council of 27 June 2001 on the assessment of the effects of certain plans and programmes on the environment. OJ L 197, 21.7.2001, P. 30-37.

<sup>9</sup> Act LIII of 2006 on Accelerating and Simplifying the Implementation of Investments of Priority National Economic Importance. Repealed by Act C of 2023 on Hungarian Architecture.

<sup>10</sup> [https://www.facebook.com/permalink.php?story\\_fbid=2892036067730015&id=1956638591269772](https://www.facebook.com/permalink.php?story_fbid=2892036067730015&id=1956638591269772)

<sup>11</sup> <https://www.youtube.com/watch?v=iUrG4atZJFY> One site was not chosen by Northvolt because it was home to a significant frog population and another was partly a nature reserve.

<sup>12</sup> <https://www.biokutatas.hu/hu/page/show/lathatatlan-gazdagsag-a-talpunk-alatt>

square metres of high quality humus soil over a period of one year.<sup>13</sup> CATL's first European plant was announced in Germany in summer 2018 and construction started in October 2019 in Arnstadt, Thuringia, on the site of a former solar cell factory as a brownfield investment. The Hungarian National Battery Industry Strategy mentions three conditions for the selection of factory locations: 'a) the cost of expanding the utility networks (water, waste water, gas and electricity) required for manufacturing capacity can be minimised; b) easy access to international logistics routes is ensured; c) an adequate and skilled workforce is available' (p. 17). These conditions could also be met for existing old factories, but the construction of new factories is more profitable for the companies close to the government (Market Építő Zrt., West Hungária Bau Kft.) even if in many cases Asian companies use imported materials and guest workers to build their factories, leaving little opportunity for the Hungarian construction industry.<sup>14</sup>

Cell production is at the heart of the battery value chain, but it is not the only area where large quantities of toxic chemicals and heavy metals are needed, including for cathode production, electrolyte and separator film production and solvent regeneration. For factories using a large number of hazardous substances, the domestic environmental impact assessment legislation<sup>15</sup> would require an environmental impact assessment procedure, the single environmental permit procedure, to consider the direct and indirect impacts of the investment, due to the technological and chemical processes involved. Despite this, South Korean cell factories operating in Hungary for many years have not been required to carry out such an EIA, nor have the electrolyte plant (Dongwha) and the teratogen solvent (NMP) regenerator (JWH).

SK Battery, a South Korean battery cell manufacturer, submitted its application in Komárom in June 2019, and the investigation procedure was closed on 6 August by the Tatabánya District Office of the Komárom-Esztergom County Government Office, which concluded that "I accept the preliminary documentation, as the environmental impacts are not significant and there are no grounds for exclusion of the planned activity, therefore an environmental impact assessment is not required."<sup>16</sup> They also state that the company is obliged to apply to the environmental authority for a noise emission limit value and to measure the noise level after commissioning. The factory already produced 10 million battery cells in 2020.

In February 2021, it was revealed that SK will build a new factory in the Ivánca industrial park. The permission request was submitted in April 2021 for the first phase of the battery plant, which included a 30 GWh capacity lithium-ion battery cell production plant with 2,500 employees, 25 air pollution point sources, 125 delivery trucks per day, a

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<sup>13</sup> Hajdú-Bihar County Government Office 15-NT0/01706-2/2024, 28.03.2023.

<sup>14</sup> <https://24.hu/fn/gazdasag/2024/06/28/tavol-keleti-nagyberuhazasok-piacvedelem-akkumulator-magyar-epitoipar/>

<sup>15</sup> Government Decree 314/2005 (XII. 25.) on the Environmental Impact Assessment and the Single Environmental Use Authorisation Procedure.

<sup>16</sup> <https://www.kormanyhivatal.hu/download/9/f8/75000/4362%2023.pdf>



parking lot for 1,435 vehicles, using 17,000 tonnes of hazardous solvent (NMP) per year.<sup>17</sup> In its decision of 11 May 2021, FE/KTF/4423-30/2021, closing the preliminary investigation of the factory, the Fejér County Government Office concluded that the implementation of the activity would not have significant environmental impacts and that the activity was not subject to a single environmental use permit.<sup>18</sup>

For Samsung SDI's investment in Gőd and for a series of factory expansions, no environmental impact assessment procedures were required,<sup>19</sup> so the factory operated for five years without a single environmental permit. Separate decisions were taken for the approval of each stage of the expansion, stating that there would be "no significant environmental impact".<sup>20</sup> At the same time, the factory has been using more than 10,000 tonnes of hazardous solvents per year since 2019, while according to Annex 2 of Government Decree 314/2005 (25.12.2005), activities above a solvent consumption capacity of 200 tonnes per year are subject to a single environmental permit.

No standard environmental procedure and permit was required for the SungEel battery recycling plants (where scandalous pollution, poisoning and accidents have occurred) and several other factories that use hazardous substances.

On the one hand, this shows that the authority does not shy away from breaking the law in the interests of large investors. On the other hand, it also shows how the salami tactics criticised by the WWF<sup>21</sup> are being applied, according to which the much greater impact of each phase is not taken into account in aggregate, but only the small parts of each phase separately. This continues with the Chinese investments, with only the first phase of CATL in Debrecen and Huayou Cobalt (Bamo) in Acs having been approved, and with Sunwoda in Nyíregyháza having been separately assessed for excavation and piling.

In 2023, the situation has changed, because perhaps to reassure the public, the SK and Samsung SDI factories have been granted permits after environmental assessment documentation. Shortly after several people had been sickened by unreported toxic substances in Ivánca, the factory was granted an environmental permit in July. At the same time, the test facility, which will be built next to the factory to carry out safety testing and destruction of 124,000 battery cells and modules a year, did not need a disaster management and environmental permit. Decision FE/KTF/10494-41/2023 reads as usual: "No significant environmental impacts will result from the implementation of the planned activity."

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<sup>17</sup> [http://kornyezetvedelem.fmkh.hu/hird2009/2021/FE-KTF-4423-30-2021\\_1620727520.pdf](http://kornyezetvedelem.fmkh.hu/hird2009/2021/FE-KTF-4423-30-2021_1620727520.pdf)

<sup>18</sup> [http://kornyezetvedelem.fmkh.hu/hird2009/2021/FE-KTF-4423-30-2021\\_1620727520.pdf](http://kornyezetvedelem.fmkh.hu/hird2009/2021/FE-KTF-4423-30-2021_1620727520.pdf)

<sup>19</sup> [https://www.kormanyhivatal.hu/download/4/e0/f5000/04968-22\\_2020.pdf](https://www.kormanyhivatal.hu/download/4/e0/f5000/04968-22_2020.pdf) .

<sup>20</sup> Resolution of the Department of Construction and Heritage Protection of the Department of Construction (Vác) PE/ETDR-EP/8660-43/2022. [https://drive.google.com/file/d/1DqQsNo7k0\\_xvXQ-9xEta1kK\\_Hh3aMcT7/view](https://drive.google.com/file/d/1DqQsNo7k0_xvXQ-9xEta1kK_Hh3aMcT7/view), p. 14.

<sup>21</sup> [https://wwf.hvgblog.hu/2023/02/14/szalamiba-csomagolt-akkumulatorgyarak/#\\_ftn7](https://wwf.hvgblog.hu/2023/02/14/szalamiba-csomagolt-akkumulatorgyarak/#_ftn7)

Samsung SDI was granted an environmental permit after five years of - irregular - operations, with the company saying that waste water treatment, noise reduction, waste management and air pollution were not fully addressed, but requested plans to remedy the shortcomings.<sup>22</sup> The Göd-ÉRT civil association, with the help of the EMLA legal association, filed a lawsuit, which the green authority (under the government agency) had five days to deliver to the Budapest Environmental Court, but failed to do so. Finally, the action was filed by Göd-ÉRT's lawyer in February 2024. The Authority failed to submit its defence within the deadline, for which it was ordered to pay a fine of HUF 50 000, but this opened the opportunity to postpone the first hearing by at least four months and, in the meantime, to start the permit amendment procedure for the factory extension. On 24 April, the Budapest District Court ordered the suspension of the action against the environmental permit of the Samsung battery factory in Göd on the basis of an application for immediate legal protection. This should have caused the company to temporarily cease its activities pending the outcome of the case, but it did not happen. On 22 May, the Pest County Government Office issued a notice stating that the entire operation of the factory does not have to be suspended, but that the company should only limit those activities for which a single environmental permit is required, for example, the factory can only operate boilers with a total rated thermal input of up to 50 MWh.<sup>23</sup> The Government Office has suspended Samsung's further expansion procedure,<sup>24</sup> but until early July Samsung SDI had not been restricted.<sup>25</sup> In the meantime, Samsung SDI has entered the legal process with own lawyers (Bodnár, 2024b).<sup>26</sup>

Some countries take years to obtain a permit if the wastewater treatment of a factory is not fully solved. In Harjavalta, Finland, at the request of Finnish environmentalists, the authority requested a revision of the wastewater treatment of BASF's cathode precursor plant in the Finnish state of Harjavalta in the area of sodium sulphate emissions, so production has not yet started despite a permit issued in 2020<sup>27</sup>.

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<sup>22</sup> <https://atlatszo.hu/orszagszerte/2024/01/22/pert-inditottak-godi-civilek-a-zajszennyezo-akku-gyar-kornyezethasznalati-engedelye-ellen/>

<sup>23</sup> [http://os.mti.hu/hirek/186179/a\\_pest\\_varmegyei\\_kormanyhivatal\\_kozlemenye-1\\_resz](http://os.mti.hu/hirek/186179/a_pest_varmegyei_kormanyhivatal_kozlemenye-1_resz)

<sup>24</sup> [https://kormanyhivatalok.hu/system/files/dokumentum/pest/2024-05/00050-75\\_2024.pdf](https://kormanyhivatalok.hu/system/files/dokumentum/pest/2024-05/00050-75_2024.pdf)

<sup>25</sup> According to the EMLA's legal opinion, the limits set in the permit for thermal boilers do not refer to actual consumption but to capacity. A plant needs an environmental permit even if it does not operate the boilers at full capacity. In addition, as seen above, activities above an annual solvent consumption capacity of 200 tonnes/year also require a single environmental permit. Samsung used 14 477 tonnes in 2022, limiting this to 200 tonnes would be equivalent to closing the factory. In addition, to operate without a "limited" permit, the factory would also need a permit from the authorities, which it does not have (<https://telex.hu/gazdasag/2024/05/24/samsung-god-akkumulatorgyar-kapacitas-1-szazalek-engedely-kormanyhivatal>).

<sup>26</sup> <https://atlatszo.hu/kornyezet/2024/07/05/a-hatosag-szerint-korlatozottan-mukodhet-a-godi-akkugyar-de-a-samsung-leallitasra-hivatkozva-fellebbez-a-birosagon/>

<sup>27</sup> <https://cen.acs.org/environment/pollution/BASF-battery-project-delayed-environmental/102/i7>

## **The legal environment in which factories operate**

The activities of the South Korean factories in operation, as well as the reports of the newer Chinese companies, refer to a number of older Hungarian laws and regulations. One of these is the Labour Protection Act,<sup>28</sup> which set the maximum amount of the labour protection fine at HUF 10 million until March 2024, when its relevant passage was modified.<sup>29</sup> Under the current regulation, the amount of the fine that can be imposed has increased to HUF 100 million.<sup>30</sup> Up till 2024, the OSH fines imposed on Samsung, SK, SungEel (battery recycler) companies could be up to HUF 10 million even if the authorities had calculated HUF 12 or 15 million (see for example Decision PE-06/MV/002056-38/2023, on a double death case in SungEel<sup>31</sup> ). It is questionable whether the new maximum fine of HUF 100 million is a deterrent when company reports show that SungEel Hitech had a turnover of HUF 18.5 billion in 2022 and Samsung SDI had a turnover of HUF 1631 billion.

The government decree governing fire safety fines is the reference for official measures.<sup>32</sup> It lists the items in the annex and sets a maximum fine of HUF 3 million per item. It is therefore no coincidence that the authorities impose low fines on a regular basis and that factories pay these fines without any problem, and continue their irregular operations.

The Government Regulation 219/2011 (20.X.) on the control of major accidents involving dangerous substances does not list (perhaps because it was not widely used at the time) the acute and reproductive toxic solvent N-methyl-2-pyrrolidone (NMP), which was proposed by the European Commission in 2018 for inclusion in REACH XVII. (The expanding Samsung SDI will use 22,000 tonnes of NMP per year.) In recent years, there have been several reports about this substance being released into the air and groundwater in Göd. Despite this, the Samsung Safety Report of January 2024 states that "the NMP tank farm is not a hazardous substances facility according to Government Decree 219/2011 (X. 20)." And the February 2024 report of the Acs cathode plant says: "NMP is not subject to Government Regulation 219/2011 (X. 20.), so the Safety Report does not assess the effects of NMP". In other words, since it is not listed in the regulation of 13 years ago, this toxic substance is sometimes considered non-hazardous in Hungary. Except that the reference by the safety reporting companies is incorrect, because

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<sup>28</sup> Act XCIII of 1993 on Occupational Safety and Health.

<sup>29</sup> Paragraph (3) of Article 82 of the Act has been repealed by Act CXVIII of 2023 amending Act XCIII of 1993 on Occupational Safety and Health.

<sup>30</sup> See Government Decree 25/2024 (14.II.) on the amount and detailed rules for the imposition of safety at work fines, and on the rules for the registration and further training of persons authorised to carry out occupational safety activities. Article 3 (1) paragraph.

<sup>31</sup> [https://kimittud.hu/request/munkavedelmi\\_birsag\\_pe\\_06mv00205](https://kimittud.hu/request/munkavedelmi_birsag_pe_06mv00205)

<sup>32</sup> 259/2011 (XII. 7.) of the Government Decree on the organisations performing the tasks of fire protection authorities, on fire protection fines and on compulsory life and accident insurance for fire protection personnel.

hazardous substances are covered by the Chemical Safety Act XXV of 2000.<sup>33</sup> According to Article 1(1)(6) of the Act, "dangerous substance" means any substance classified as dangerous according to the CLP, i.e. the relevant EU regulation<sup>34</sup>. The CLP Table 3.1 item 606-021-00-7 is NMP. The authorities accepting the safety reports have not raised any objections due to inappropriate legal references.

In the case of NMP, we have two pieces of legislation that regulate air emissions. The first is the VM Decree 4/2011 (14.I.)<sup>35</sup> (Annex 6, point 2.3.1, class C): in case of combined emissions of several substances of different classes, if the mass flow rate is 3 kg/h or more, the emission limit value (concentration of air pollutant): *in total* not more than 150.0 mg/m<sup>3</sup>. The other is Annex 4 to VM Decree 26/2014 (25.III.2014)<sup>36</sup> on the exhaust emission limit values for substances with carcinogenic, mutagenic or toxic for reproduction toxicity: where the sum of the mass flow rate is equal to or greater than 10 g/h, the VOC exhaust emission limit value is 2 mg/m<sup>3</sup> for the total mass of the compounds. *The two equivalent pieces of legislation therefore set different limit values for NMP.* The authorities have not applied VM Decree 26/2014 (25.III.2014) in setting the limits. In the case of Samsung SDI, a limit value of 150 mg/m<sup>3</sup> was set for five years, but not in total, but *per point source*, so the authorities again violated the law. (Samsung has 28 air polluting point sources where NMP can be emitted, and the number of these sources is increasing as the factory expands.) When the factory was first granted a single environmental permit in December 2023, a limit value of 2 mg/m<sup>3</sup> was set, as was SK Battery in Komárom at the end of November 2023. For CATL's German plant, the limit value for NMP is still 1 mg/m<sup>3</sup>,<sup>37</sup> although this solvent is not yet used there, while for the Debrecen plant, the third amendment to the single permit in June 2024 sets *three different* limit values for *three point sources* (1 mg, 20 mg and 25 mg per cubic metre).

The Decree 4/2011 (14.I.) of the Ministry of Transport and Communications<sup>38</sup> does not contain any limit values for carbonate compounds in relation to air pollution level limits. In the case of Samsung, this is described in the full environmental review document: 'Carbonate compounds are classified as air pollutants on the basis of their chemical properties, but Decree 4/2011 (I. 14) VM does not contain an emission limit value for carbonates. According to point 2.3.4 of the Regulation, if the Regulation does not contain an emission limit value for a substance, the substance shall be assigned to the

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<sup>33</sup> Act XXV of 2000 on Chemical Safety.

<sup>34</sup> Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006 (Text with EEA relevance). OJ L 353, 31.12.2008, P. 1-1355.

<sup>35</sup> 4/2011 (I. 14.) VM Decree on air pollution level limits and emission limit values for stationary sources of air pollution.

<sup>36</sup> 26/2014 (III. 25.) VM Decree on the limitation of emissions of volatile organic compounds from certain activities.

<sup>37</sup> Approval notice No 18/20, 13, 15.page

<sup>38</sup> 4/2011 (I. 14.) VM Decree on air pollution level limits and emission limit values for stationary sources of air pollution.

class to which the substances in the table nearest to it are assigned in terms of environmental impact" (p. 74). The authors of the document do not consider the situation to be satisfactory either, stating that 'the measurement of carbonate compounds in air is not a measurement problem for environmental analytical laboratories and we recommend that the legislator should set an emission limit value for carbonate compounds' (p. 330).

In the case of cobalt and manganese air pollutants, the legislation in force does not set health limit values (they are not included in Annex 1 of Decree 4/2011 (14.I.VM.), but only a planning guideline value, which is the air pollution level to be used for delimiting the area of impact of the activity and for preparing dispersion models. This is also referred to in the environmental permit for the cathode plant in Acs (KE/041/01372-75/2024 p. 54).

Who should be responsible for pushing for the revision and harmonisation of old legislation? Not only the battery industry, but also industrial development no longer has a single ministry or person responsible for it, and the field is fragmented. The government offices are run by persons loyal to the government (for example, the Pest County Government Office is headed by an old Fidesz-KDNP cadre who signs all decisions concerning Samsung). The offices are understaffed and lack the resources to carry out inspections. With the planned transfer of disaster management to government offices, licensing will become even more centralised.

In any case, in October 2023, the Hungarian Chamber of Engineers published an 87-page guidance document on the manufacture of lithium-ion batteries and their components "for environmental experts and official procedural actors".<sup>39</sup> The guidance notes that neither the licensing documentation, the technical analysis and assessment of the activity nor the subsequent regulatory procedures have been standardised so far, while these new technologies involve the use of large quantities of harmful substances (heavy metals, toxic metals, carcinogens) with significant environmental risks. Even if the limit values are complied with, the quantities of air pollutants released into the environment are significant due to the large quantities involved, as are the quantities of toxic and heavy metals released into the receiving medium.

The Hungarian Battery Association brings together the players in the Hungarian battery industry chain, with eighty-four members (including universities, service providers, engineering companies and several battery factory safety reporting companies) at the beginning of 2024. In 2023, the Association's turnover was HUF 118 million (of which HUF 80.8 million stemmed from membership fees), and personnel expenses HUF 55 million.<sup>40</sup> According to the website, the tasks of the Environment, Safety, Health (EHS) Working Group include cooperation with governmental and institutional

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<sup>39</sup> <https://www.mmk.hu/tagjainknak/segedletek/fap#kornyezetvedelem>

<sup>40</sup> <https://www.hu-ba.hu/>

decision-makers. However, it is not publicly available what recommendations they make to decision-makers.

The permit application materials are prepared by persons qualified as environmental experts, but the materials are registered by the *companies that employ the experts*. The names Generisk, Envipro and IMSYS Ltd are probably the most common, but we may also see the names CK-Trikolor, Mott MacDonald and Lawand. Samsung and SK documentations are regularly produced by Generisk, as is the latest CATL security report. The reports of the Dongwha electrolyte plant in Sósút, the cathode plant in Ács, SungEel and Andrada were compiled by IMSYS Ltd. The responsibility of the companies involved in the investigations can be raised even if the government agency can in principle overrule their recommendations later. The authors of the document must have detailed knowledge of the technology, the raw materials, the waste generated, the amount of energy and water to be used and the waste water discharge. These data are often not available at the early design stage and battery companies often rely on estimates. Experts must act on the basis of the precautionary principle and the principle of maximum safety. This has not always been the case in recent years (see Samsung, Dongwha and SK not being classified as requiring a permit). There have also been cases where, after the local disaster management authority objected to the expansion of the irregular SungEel plant in Bátortereny, the government agency recommended an environmental impact assessment, which was carried out by IMSYS Ltd. The same study describes numerous irregularities (e.g. 218 bags of hazardous waste containing heavy metals were stored in the open air, partially open, directly exposed to rain), but the Government Office Decision NO/KVO/117-16/2023<sup>41</sup> granted "an environmental operating permit on the basis of a full environmental review of the site at Bátortereny 941/29, and an application by IMSYS Engineering Services Ltd."

Ideally, it is in the interest of *the battery companies themselves* to operate in a compliant and environmentally friendly way, for their own reputation. In Sweden, for example, Northvolt itself has written an open letter calling for stricter EU regulations to promote sustainability.<sup>42</sup>

So far, old regulations were mentioned, but new ones have been introduced between 2022 and 2024. On May 5, 2022, a decision by the Minister of Agriculture (file no. TMF/13-7/2022) abolished the existing ecological network corridor in the area where CATL is now building. Thus, the environmental use review documentation for the factory, which was completed in November, could already have included the fact that the project *does not affect* an ecological network corridor.

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<sup>41</sup> <https://kimittud.hu/request/sungeel-batorterenyi-uzem-vizmo>

<sup>42</sup> <https://northvolt.com/articles/an-open-letter/>

The Government Decree 146/2023 (IV.27)<sup>43</sup> stipulated that public hearings may be held online without the personal presence of the persons concerned. Since then, municipalities involved in battery production have made use of this possibility. The first was held in Göd in October 2023, followed by Debrecen a few months later, and the latest in April 2024 in Ács. At these, residents can only ask questions in writing, and on a set date the authority will respond to a selection of these, with no further response possible. For comparison, before the start of construction of the CATL subsidiary in Germany, Amt Wachsenburg in August 2019, Arnstadt in September and the whole region in December, there was a well-publicised public hearing in the evening, where the Minister of Economic Affairs of the Land and the German State Secretary for Infrastructure were among the residents (Living, 2023). In Gera, Germany, in the spring of 2024, the authority received eight thousand comments from residents and experts on SungEel's application for an environmental permit, and postponed the public hearing scheduled for May until the autumn to allow the comments to be processed. The permit application is suspended until then (Bodnár, 2024a).

Government Decree 432/2023 (21.IX.) on the contract with the environmental authority states that, „due to the emergency situation caused by the armed conflict in Ukraine” (sic!), it is sufficient for the polluting plant to conclude a contract with the authority, in which it undertakes to try to make its operations legal in the future and not to face any fines or suspension of its activities during the period specified in the contract. The outcry over the regulation has resulted in a ministerial order with a confusing text which does not legally override the regulation.<sup>44</sup> The "polluting companies should pay" principle<sup>45</sup> previously invoked by the Prime Minister does not effectively apply to battery factories in Asia. So more and more regulations are paving the way for the Korean and Chinese factories, which already have many environmental and natural consequences.

According to Government Decree No 119/2024 (10.VI.)<sup>46</sup>, from 1 July, the second-instance authority within the Ministry of Energy is the Deputy State Secretariat for Environmental Authority Affairs. It has the competence to hear appeals against preliminary and environmental impact assessments and against first-level integrated environmental management permits, and has supervisory powers over first-level environmental authorities. In this way, the government is seeking to settle disputes over environmental permits for battery factories, for example, within the administration rather than in court.

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<sup>43</sup> Government Decree 146/2023 (IV. 27.) laying down certain rules on the operation of certain organisations during an emergency and certain administrative procedural rules.

<sup>44</sup> <https://wwf.hu/nincs-ok-a-megnyugvasra-tovabbra-is-veszelyben-a-kornyezetunk-vedelme/>

<sup>45</sup> <https://pannonrtv.com/rovatok/politika/orban-viktor-klimavedelemrol-ne-haztartasok-hanem-szennyezo-cegek-fizessenek>

<sup>46</sup> Government Decree No 119/2024 (10.VI.) amending certain Government Decrees relating to the environmental authority procedure.

## **Environmental impacts**

### *Water treatment*

In Hungary, the Ministry of Environment was abolished in 2010, and the professional staff for environmental protection was gradually and drastically reduced. Green authorities have been subordinated to government agencies, and national parks have low budgets (Éltető & Ricz, 2023). Nature conservation has become completely vulnerable to power politics.<sup>47</sup> This is already reflected at the EU level, as Hungary vetoed in March 2024 the Nature Restoration Act, which it had supported for a long time, so that its adoption could only be put on the agenda later.<sup>48</sup>

At the same time, restoring some of the wetlands is of paramount importance for climate protection. Moreover, Hungary ranks second in the world in terms of wetland loss over the last century (Fluet-Chouinard et al., 2023), due to river regulation and floodplain loss. Researchers have shown that restoring wetlands over as large an area as possible is practically the only viable strategy to combat drought (Timár et al., 2024). The massive establishment of battery factories has had a detrimental impact on wetlands in several ways. On the one hand, hundreds of hectares are being concreted over due to construction. This is illustrated in the preliminary assessment document for the excavation and piling works of the Chinese Sunwoda cell factory in Nyíregyháza: 'After landscaping, the amount of green space will be reduced, which will be only slightly offset by the planned planting of humus ponds. Rainfall run-off patterns will be significantly altered, which will have a negative impact on the water retention capacity of the site and its surroundings. Given that the design of the stormwater storage ponds is planned with a water-locking bottom, the proposed earthworks and piling will have a negative impact on the water regime of the area.' (p. 94) In addition, the relocation of the stream in the area has been approved by the environmental permit and is under construction.

On the other hand, the water-intensive operation of the factories also affects groundwater aquifers, which threatens the ecosystems and wetlands that depend on them.<sup>49</sup> According to the law, the National Environmental Information System should provide information on the status of groundwater and surface water in Hungary in specific areas. For years, however, this part of the system has only been under

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<sup>47</sup> We have now reached the point where, for example, a political secretary of state questions the conservation decision of a renowned conservationist in a public video, and name-calls him along with local environmental NGOs (Riba, 2024).

<sup>48</sup> <https://www.greenpeace.org/hungary/blog/11000/miert-baj-hogy-a-magyar-kormany-elgancsolta-az-unio-termeszet-helyreallitasi-rendeletet/>

<sup>49</sup> "Water abstraction can cause springs to dry up or their original natural yield to decrease. A significant impact is caused by a drop in groundwater levels where the water body fed a small watercourse or shallow lake, such as a salt lake, which is so common in our country. Good groundwater quantity is important for small watercourses and shallow lakes because they are the only source of groundwater during periods of low rainfall. Groundwater abstraction can also affect the quality of life of groundwater-dependent ecosystems" (VGT 3, p. 51).



development. According to the latest "Hungary's 2021 River Basin Management Plan"<sup>50</sup> (VGT 3), the data analysed in the plan (2019) showed that 38% of groundwater basins were in poor condition or at risk of poor condition, and 19% had deteriorated in quantity and quality compared to the previous VGT.

SK (Komárom) and Samsung SDI (Göd) are located on the Danube and mainly use the bank filtered wells. The enlarged LG Toray separator film plant and the cathode plant in Acs will also be located near or on the Danube.<sup>51</sup> In Hungary, one third of water production is based on bank-filtered aquifers, which are connected to rivers, whose water is transported to the water production wells through a layer of gravel and sand. In addition to natural factors, water production is also responsible for the seepage of water into the riverbed and the flow of water towards the well. This triggers mechanical, physico-chemical and microbiological processes, reducing pollutants. Climate change is already having an impact on the Danube, partly by increasing temperatures and partly by increasing extremes (ebb and flood). Increasing temperatures can damage chemical and microbiological processes in water purification, and extreme water levels can change the direction, speed and timing of seepage (Goda, 2019). The question is how the increased water abstraction by factories will change the quantity and quality of water extracted. Samsung SDI's water demand is projected to increase to 7,534 m<sup>3</sup> per day by 2025 (*Figure 1*). The factory's water demand will lead to the premature opening and rehabilitation of the contaminated bank-filtered wells in the southern Vác aquifer, which were closed in 1980. Samsung's industrial wastewater is piped to Vác through the Sződliget area. In 2025, 24,000 m<sup>3</sup> of industrial water and 10,000 m<sup>3</sup> of wastewater will pass through the water network in 2025. No one has yet answered the question of why the plant needs three times the water extraction capacity and what impact this will have on the water resources.<sup>52</sup>

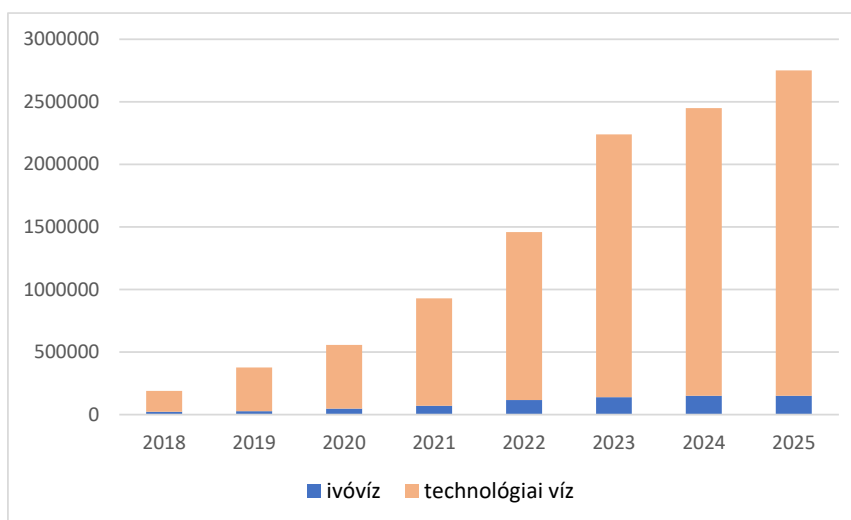
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<sup>50</sup> <https://vizeink.hu/vgt/#page=1>

<sup>51</sup> [https://drive.google.com/drive/folders/15\\_xMYjuXPWqInZLG3ZZjosYgrwW9-sS](https://drive.google.com/drive/folders/15_xMYjuXPWqInZLG3ZZjosYgrwW9-sS)

<sup>52</sup> <https://greenfo.hu/hir/valami-nagyon-nem-stimmel-a-godi-samsung-gyar-vizellatasa-korul/>

Figure 1: **Samsung SDI annual water demand, cubic metres**



blue = drinking water, orange = technological water

Source: Samsung, 2023, pp. 185-6; Samsung, 2024, p. 31.

A similar large-scale expansion is also seen in Komárom, where the capacity of the coastal filtered wells has been tripled (to 12,000 m<sup>3</sup> per day). The construction of a high-capacity water pipeline carrying karst water from the Tata basin could threaten the survival of wetlands and springs in Tata due to the expansion of the Komárom and Tatabánya industrial parks.<sup>53</sup>

Debrecen has no rivers, and the permits available so far for many battery manufacturing activities are based on groundwater use. The EcoPro Global cathode plant's 364-page "Consolidated Impact Assessment Procedure and Application for a Single Environmental Use Permit" writes (page 88): "The operation of the plant will result in the withdrawal, use, purification and discharge of significant quantities of groundwater to the atmosphere as evaporative losses and to surface water as treated wastewater due to the extensive use of industrial water... The operation of the plant may cause a long-term and significant depletion of groundwater resources, leading to a quantitative and therefore qualitative deterioration of groundwater resources... The impact will be detrimental to groundwater." The daily water demand for the EcoPro cathode plant is documented as 3306 m<sup>3</sup>, and the first phase of CATL has also indicated an average water demand of 3378 m<sup>3</sup> in its environmental use document, as amended for the third time in June 2024 (peak water demand will be 6232 m<sup>3</sup>).

<sup>53</sup> <https://24.hu/fn/gazdasag/2023/05/26/akkumulatorgyar-akkugyar-komarom-viz-vizugy-karsztviz-tata-tatabanya-sk-innovation-beruhazas-civil-meszaros-lorinc-vizvezetek-fakivagas-kornyezetpusztitas-termeszet/>

Other written material also predicts the depletion of aquifers below Debrecen and its surroundings. The Regional Water Resources Management Plan of the Tiszántúli Water Directorate (TIVIZIG) was completed in 2021.<sup>54</sup> At that time, there was no question of the mass establishment of battery factories, but the factors affecting groundwater abstraction were carefully examined. It was found that, in addition to the 14.7 million m<sup>3</sup> of official abstraction per year, the estimated unreported abstraction from illegally drilled wells was 26.6 million m<sup>3</sup>. The study concludes that recharge and infiltration are slowing down, "reducing future groundwater demands" is necessary (p. 46). TIVIZIG also provided an expert opinion on the CATL environmental review documentation. It states that "water demands on the Debrecen aquifers could approach groundwater demand limits within one to two years." The company's report is flawed, serious pollution is expected in the event of a disaster, and a redesign of the city's water management is recommended. TIVIZIG's director was subsequently dismissed in March 2023.<sup>55</sup>

To reassure the public and themselves, the authorities have recommended to CATL the use of treated wastewater technology, and this is often repeated. Its implementation is not yet fully developed and is quite costly. It is likely that the mixture of treated wastewater, rainwater and water piped from the Eastern Main Canal will have to undergo an ultrafiltration process before it is sent to the cooling towers. At the same time, the treated wastewater that has been flowing into streams and lakes is vital to maintaining surface water and ecosystems, and it is unclear what will happen to these wetlands once the wastewater flows to the factories.<sup>56</sup> The effluent from the factory will no longer be reused, according to the environmental permit: 'Due to the need to minimise water use and the strict water quality requirements of the technology, reuse of the effluent is not feasible' (p. 73).

The operation of factories can also cause pollution of groundwater and surface water, either through irregularities, accidents or run-off. One of the first such cases to be made public was the contamination of NMP found in samples from groundwater wells in Göd (NMP is needed for the production of cathode material. In the spring of 2022, an independent engineering firm was commissioned by the Göd-ÉRT Association to sample groundwater wells at three locations in the municipality. Laboratory analysis found 12-17 µg/l NMP in the water samples. "The presence of this compound cannot be explained by natural causes. Human health effects range from skin and eye irritation to reproductive toxicity. The compound is known to be used as a solvent in the manufacture of lithium

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<sup>54</sup> <https://www.tivizig.hu/tizantuli/vizgazdalkodas-vizszolgaltatas/vizkeszlet-gazdalkodas>

<sup>55</sup> [https://www.debreciner.hu/cikk/13144\\_ime\\_a\\_teljes\\_szakvelemenyt\\_catl\\_tivizig\\_unikum](https://www.debreciner.hu/cikk/13144_ime_a_teljes_szakvelemenyt_catl_tivizig_unikum)

<sup>56</sup> In the summer, for example, the Óreg lake in Tata is 80 percent treated wastewater. The groundwaters of Tata, Tatabánya, Ács and Komárom are interconnected, and residents there are also concerned about increased industrial water abstraction. Mining activities under socialism have drained resources. Groundwater aquifers have taken 25 years to regenerate. Recently, changes in rainfall patterns have reduced their recharge.

batteries," the study report says.<sup>57</sup> The Dunamenti Regional Waterworks Ltd (DMRV) tested the drinking water of Göd and Samsung's wastewater, and found no NMP in them.<sup>58</sup> No investigation was launched into how NMP could have entered the groundwater wells.

In February 2024, Samsung's wastewater was spread over the land in Göd. Greenpeace's sampling also revealed the contamination with NMP. According to a statement from the DMRV, the incident was caused by a blockage in the municipal sewage pipeline. It was this wastewater that was contaminated with the toxic agent, which would be absolutely prohibited.<sup>59</sup>

The CATL environmental permit (p. 41) and the SK On factory in Ivánca (p. 37) for the concentration allowed in the factory effluent discharged to the public sewer state the NMP limit as "the *first concentration measured at the start of the activity*, accepted by the authority as the baseline." The same is also stated in the environmental permit for the cathode plant in Ács concerning the NMP that can be discharged into the Concó stream (p. 42). Since toxic NMP does not occur naturally, the limit value should be zero. As the Environmental Protection Section of the Hungarian Chamber of Engineers states, 'there are few more absurd regulations from a technical point of view than to link the emission limit value to the first concentration measured at the start of the activity'. In practice, this gives the authority the right to allow the user of the environment to produce even unrealistically high emissions at the start of his operation, because he can easily comply with this later. This rule is in clear contradiction with Article 6(3) of Act LIII of 1995 on the Environment, which provides that the most efficient solution must be adopted in the use of the environment.<sup>60</sup>

The harmful effects of pollution in soil and groundwater only appear later, when they are dangerous to wildlife or humans. There are some compounds that are not widely discussed, such as the carcinogenic perfluoroalkyl chemicals (PFAS) produced by the combustion of PVDF, which is also used in battery production. This is the main coating layer in separator film factories starting up or expanding in Hungary (Semcorp, LG Toray). The EU is planning to restrict the use and production of PVDF and its compounds this year, as they are "eternal" materials, they do not decompose but accumulate in nature. Control and soil decontamination are in many cases limited and very costly. And any pollution of the drinking water base will cause irreparable damage (MMKKT, 2024).

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<sup>57</sup> <https://drive.google.com/file/d/1VAUdfzPi1pY8tkREvr-K6tKbFmWDuyQF/view>

<sup>58</sup> [https://www.dmrvzrt.hu/static/internet/download/22\\_589\\_1\\_6.pdf](https://www.dmrvzrt.hu/static/internet/download/22_589_1_6.pdf)

<sup>59</sup> <https://www.greenpeace.org/hungary/sajtokozlmeny/11078/a-greenpeace-a-godi-kommunalis-szennyvizben-talalt-akkumulatorgyartashoz-hasznalt-magzatkarosito-oldosert/>

<sup>60</sup> <https://www.mmkkornyezetvedelem.hu/index.php/component/content/article/8-hirek/94-a-li-ion-alapu-akkumulator-gyartassal-osszefuggo-engedelyezesi-eljarasokban-a-kibocsatott-szennyviz-nmp-koncentraciojara-vonatkozo-hatarertek-megallapitasa-soran-figyelembeveendo-szemponatok?Itemid=170>

*What gets into the air?*

Air protection is regulated by Government Decree 306/2010 (23.XII.2010), which defines the concept, characteristics (e.g. stationary or non-stationary) and area of influence of point sources of air pollution. Accordingly, the various pollution data measured in municipalities are public. According to Articles 31-32 of the Decree, the operator of an air pollution source that is obliged to provide data shall submit an annual air quality protection report to the regional environmental protection authority by 31 March of the year following the year in question. The data must be submitted electronically and must include the pollutant point sources, the substance name and the emission value. Based on the data submitted, the environmental protection authority shall keep a basic air quality protection register and an air pollution level register. These are accessible via the Internet through the public interface of the National Environmental Information System (OKIR). The documentation submitted as part of the data provision must be kept for at least 5 years.

According to the government decree, air pollution data for a given calendar year must be published by 30 October of the year following the calendar year at the latest. However, until January 2024, the OKIR database was not updated, but only showed the 2020 data as the last year.

Even if they comply at all, the battery factories' air pollution data will still be largely based on self-reporting. Let's look at the OKIR data for the battery plants in Komárom and Göd (*Table 1*)

**Table 1: Quantities of certain substances emitted to air between 2020 and 2022, in kg**

	SK ON, Komárom			Samsung SDI, Göd		
	2020	2021	2022	2020	2021	2022
CO <sub>2</sub>	2 004 425 818	28 379 355	41 143 025	n.a.	9 558 210	12 291 656
NMP	403	2151	4464	354	81 468	5858
NO <sub>x</sub> *	6691	12454	16961	n.a.	6286	8410

\* Nitrogen oxides

Source: OKIR

There has been a visible increase in nitrogen oxide emissions. They play a major role in acid rain, but also cause respiratory diseases and conjunctivitis. Strangely, the Komárom plant's carbon dioxide emissions were very high at 2 million tonnes in 2020, especially compared to almost a tenth of that in the following year and 41,000 tonnes in 2021. In the

case of Samsung, the 81 tonnes of NMP emission in 2021 is also an outlier, which was only discovered at the beginning of 2024. (Instead of going directly to the authorities, the mayor of Göd has filed a police report on the matter, so the investigation will take a long time.) There are several possible explanations, one being that there was some kind of malfunction or accident sometime that year. Another is that the „normal” figures are too low to be true. Indeed, factories do not report data for all point sources, and the OKIR sometimes shows "zero" (where emissions are zero, the number 0 is shown). This is suggested by the response of the county bailiff to a public interest request in relation to the NMP outliers: "The 3 pages of the 2021 LM data submission contain the reported data for the point sources that result in high emissions (P66, P95). Only data for the 3rd and 4th quarter of the P95 point source are supported by measurement results. *No further measurement report for these point sources has been submitted* to the Environment Agency, therefore *the remaining data can be considered as estimates.*"<sup>61</sup> In other words, the measurement data reported by the factories are not complete in the system, the rest is estimated (?). If we are to estimate, let's take the first phase of CATL with a similar capacity to Samsung, where the factory reported 288 thousand tonnes per year of CO<sub>2</sub> emissions from its ten natural gas fired boilers (175 MW thermal capacity). If we consider that Samsung has 18 boilers (115.4 MW of thermal capacity, but soon more due to expansion), it is quite strange to have only 12 thousand tonnes of CO<sub>2</sub> emissions in 2022, because we would expect about 190 thousand tonnes.

About 85 percent of the water used in battery cell plants evaporates through cooling towers and point sources. Water vapour is the most potent greenhouse gas, responsible for 60 per cent of the greenhouse effect, but as we cannot control naturally occurring evaporation, it is less discussed (Szilágyi & Józsa, 2008). The greenhouse gas emissions of many battery factories are in conflict with national and local reduction strategies, but no decision-makers are interested.

The question arises: who and how will check the data provided by the factories, and what will be the consequences if they do not provide it? As one interviewee said, there are measuring trucks, the authorities could measure the air quality outside the factory for up to two weeks at a time. In the last five years, despite a series of irregularities, no measurements have been taken in or around South Korean factories.

According to the website, the EHS Working Group of the Hungarian Battery Association "initiates and supports the establishment of a national monitoring system to continuously monitor and investigate the presence of hazardous substances from temporary energy storage systems in the environment throughout the country... including... the establishment of laboratory infrastructure".

In Debrecen, the establishment of an external monitoring committee, agreed between the municipality and the University of Debrecen, attracted considerable media attention

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<sup>61</sup> [https://kimittud.hu/request/samsung\\_sdi\\_magyarorszag\\_zrt\\_leg#outgoing-34814](https://kimittud.hu/request/samsung_sdi_magyarorszag_zrt_leg#outgoing-34814)

in spring 2023.<sup>62</sup> "In addition to its scientific and analytical work, the new cooperation will have the task of informing the people of Debrecen on an ongoing basis", the document states, but no progress has been made in a year, not even a baseline measurement, which is essential for benchmarking future measurements. However, the effects of the Semcorp separator foil plant, which is now in trial operation, are already being detected by the civilians' measuring equipment.<sup>63</sup>

While airborne pollutants are imperceptible and accumulate slowly in the body, the noise from factories is heard once they start operating. This was the case in Komárom, Göd and Ivánca. In all three places, complaints were regularly received from residents, most of all from the inhabitants of Göd, where the factory is located a mere 50 metres from one part of the town. Despite a series of complaints, it took four years for the factories to address the problem, but no effective solution was found. In the case of Samsung, the government agency was again very lenient, repeatedly asking the factory to prepare a noise abatement plan with deadlines of one and a half years, which were then extended. Since 2019, the Göd-ÉRT association has been petitioning for the establishment of a protective forest. The few canes planted before the 2022 elections quickly dried out, and it was only in the spring of 2024 that several strips of more viable saplings were planted. In April 2024, a 4 m high transparent wall was erected around the playground near the factory. At the same time, the factory is on average 25 metres high, but in several places it is 50 metres high.

## Waste, scrap

Companies in the battery chain, which use many chemicals, generate huge amounts of hazardous waste. This includes not only waste batteries, but also contaminated filters, protective equipment, sludge containing heavy metals, etc. According to OKIR data, Samsung SDI was the second largest hazardous waste generator in Hungary in 2022 with 35.1 thousand tonnes. Since 2022, Samsung has expanded and will continue to expand in the future, making it the country's number one hazardous waste generator. Or is it already, but we just don't know it officially? In fact, Samsung SDI *has reclassified* a large amount of waste (waste batteries) previously considered hazardous as *non-hazardous* from 2020 to 2021 (*Table 2*).

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<sup>62</sup> <https://www.dehir.hu/debrecen/megkezdte-a-munkajat-a-debreceni-kornyezeti-monitoring-bizottsag/2023/04/18/>

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[https://m.facebook.com/story.php?story\\_fbid=pfbid0Ph7MTdQPvtad8ocY8szroSS19XzqHS9BqjCzNQTkgXhuX5XH8sbHQAu1mdML9YDol&id=100091405532381](https://m.facebook.com/story.php?story_fbid=pfbid0Ph7MTdQPvtad8ocY8szroSS19XzqHS9BqjCzNQTkgXhuX5XH8sbHQAu1mdML9YDol&id=100091405532381)

Table 2: Waste losing its hazardous character at Samsung (kg)

HAK code	Name	2020	2021	2022
16 02 15*	hazardous material removed from discarded equipment	1 894 385	0	0
16 06 05	other batteries and accumulators	571 761	3 609 521	2 278 343

Source: Samsung SDI full review documentation 2023, p. 203, cited by Hungarian Chamber of Engineers Environmental Protection Section (MMKKT, 2024).

The reclassification was made possible by the EU legal environment. In the European Waste Catalogue, there is no specific code for lithium-ion batteries: waste holders can use the generic code "other batteries and accumulators" (European Court of Auditors, 2023). However, it is expected that in 2024, with the amendment of the relevant European Commission Decision<sup>64</sup>, the classification of Li-ion batteries will be changed to hazardous waste.

Factories can reclassify waste, but the authority is under no obligation to accept it. In comparison, other county authorities were lenient, as the single environmental permit issued in November 2023 (KE/041/03155-15/2023) for the SK Battery factory in Komárom states that "During the production of battery cells, damaged and/or scrap cells are expected to be generated and recorded as waste *under* waste identification code 16 06 05 other batteries and accumulators" (43. However, this permit was amended in November (KE/041/04525-10/2023), where the Department of Environment, Nature Protection and Waste Management of the Komárom-Esztergom County Government Office wrote: "The need to change the waste identification code for the identification of damaged and/or discarded cells in the production of battery cells has arisen, and therefore, in the present ex officio amendment procedure, the waste previously identified as 16 06 05 has been reclassified as 16 03 03\*." The latter code is "inorganic waste containing hazardous substances (waste lithium-ion cells in non-disassembled form)". Samsung's permit issued in December 2023 does not even include this HAK code, so *the county authorities are not uniform in the waste classification they allow*. A document from the Chamber of Engineers also refers to this: 'the classification of waste into different types and the definition of hazardousness vary widely. This is of concern because, for similar or identical technologies, it is unlikely that hazardous waste will be generated in one place and non-hazardous waste in another, using the same input and technology' (MMKKT, 2024).

<sup>64</sup> Commission Decision of 3 May 2000 replacing Decision 94/3/EC establishing a list of wastes pursuant to Article 1(a) of Council Directive 75/442/EEC on waste and Council Decision 94/904/EC establishing a list of hazardous waste pursuant to Article 1(4) of Council Directive 91/689/EEC on hazardous waste. OJ L 226, 6.9.2000, P. 3-24



However, many waste batteries do not stay in the factories but are sent to an external waste management company. The environmental permits only state this, although it is essential to describe the collection, storage, transport and treatment of all waste from the production process, and to analyse the environmental impact of transport and the risk of possible accidents (MMKKT, 2024). Samsung's environmental documentation for its latest expansion also states: 'SAMSUNG SDI Hungary Zrt. The operator does not plan to change this practice after the expansion' (p. 170). Article 31(9) of the Waste Act<sup>65</sup> should also apply to the full responsibility of battery plants: 'If the original waste producer or the waste holder delivers the waste to a waste treatment facility for the purpose of carrying out preparatory operations prior to recovery or disposal, this does not exempt him from the responsibility for carrying out the full recovery or disposal operation'.

The problem of managing discarded batteries is shown by the number of illegal dumps found in several parts of the country in 2022-2023 (Table 3).

**Table 3: Illegal discarded battery waste**

	<b>quantity (tonnes)</b>	<b>origin</b>	<b>location</b>
Iklad	663	Samsung	abandoned industrial estate
Abasár	1700	SungEel	former barracks
Salgótarján	594	Samsung	old steelworks
Mocsa	83	SK, Komárom	landfill
Sárbogárd	10 000	SK, Ivánca	old plant
Mohora	1000	Samsung	old field for geese

Source: articles from *Átlátszó* 2023<sup>66</sup>, *Portfolio*<sup>67</sup> and *Mérce*<sup>68</sup>.

In the Abasár case, which also affects a Natura 2000 site, the Heves County Government Office fined the contractor and transporter Tibor Karácsony (who did not pay) HUF 103 million in August 2023. After further fines, on 28 March 2024, another HUF 500,000 fine was imposed (HE/HGO/00065-45/2024): *"the storage of large quantities of hazardous waste without a permit and without official control resulted in environmental hazards.*

<sup>65</sup> Act CLXXXV of 2012 on waste.

<sup>66</sup> Bodnár, Zs. (2023). "The classification of 83 tons of hazardous waste from the battery factory in Komárom was falsified in the processing plant in Mocsa" (*Átlátszó*, 5 April); "600 tons of batteries were stored without fire protection in Salgótarján, then dumped outside" (*Átlátszó*, 12 June.); "The stinking barrels have been taken away, but the hazardous battery waste is still in the mountains in Iklad" (*Átlátszó*, 16 August); "Hazardous battery waste continues to be stored in Abasár, despite a fine of hundreds of millions of euros" (*Átlátszó*, 18 October).

<sup>67</sup> <https://www.portfolio.hu/ingatlan/20240224/tobb-tizezer-tonna-akkumulator-hulladekot-tarolnak-lakohazak-kozvetlen-kozeleben-671003>

<sup>68</sup> <https://merce.hu/2024/07/19/engedely-nelkul-taroljak-a-samsung-akkuhulladekat-egy-nogradifaluban/>

*Furthermore, a further thirty deadlines for voluntary compliance after the original deadline for compliance had passed without result, and the fine was imposed for the thirty-first time, and therefore the fine was not reduced."* This illustrates the inertia of the authority: fines have already been imposed more than 40 times and in 10 months the polluting waste has still not been removed.

The Mocsa case shows that an external waste management company can change the classification of waste. This is one of the largest sites of Éltex Waste Management Ltd, where an investigation was launched in 2021 following complaints from residents about the stench. Éltex is one of the oldest waste treatment companies, operating since 1989. In January 2022, 70 percent of the company was sold to a holding company, whose ultimate owner is István Tiborcz through a private equity fund and a fund manager, a bank (Vácz, 2022). An official inspection at Mocsa found 83 tonnes of waste from battery production containing hazardous heavy metals (06 03 15\*) stored irregularly, without a code marking, and reclassified as non-hazardous non-ferrous (19 12 03). When it was taken over by another waste management company from the SK battery factory in Komárom, 15 km away, the waste was still hazardous, but when it was transferred to Éltex (on paper with the addition of a site in Kistarca) the code was changed. This was because Éltex was not authorised to treat so much hazardous waste at the Mocsa site.<sup>69</sup> Although Éltex has received several fines, unlike other companies, these are not in the OKIR database.

In Salgótarján, Éltex was also fined in connection with investigations into the fire of a lorry transporting scrap batteries to the site. The Government Office of Nógrád County imposed a fine of HUF 1.3 million for storing 32 tonnes of lithium-ion batteries in the open air without protection.<sup>70</sup> In March 2023, the Nógrád County Directorate for Disaster Management fined the company HUF 1 million and banned it from continuing its activities at the site for 45 days because nearly 600 tonnes of waste batteries were stored without a functioning fire protection system, despite the fact that Éltex had been obliged to do so by the authority a year earlier.<sup>71</sup> In January 2024, Éltex was fined a further HUF 100,000 (waste management) because the company had declared that it had not stored battery waste, but the site inspection found that it had.<sup>72</sup>

Éltex is also the main waste treatment company for the Göd, Komárom and the forthcoming Ivánca test plant. According to Samsung's latest environmental documentation, "Samsung SDI Hungary does not carry out any waste management

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<sup>69</sup> <https://atlatszo.hu/orszagszerte/2023/04/05/a-komaromi-akkugyarbol-szarmazo-83-tonna-veszelyes-hulladek-besorolasat-hamisitottak-meg-a-mocsai-feldolgozoban/>

<sup>70</sup> [ÉLTÉX.1.3mill.358 1 2023.Pltx b6rsag.pdf - Google Drive](#)

<sup>71</sup> [anonymous 178 4 k telez s s b rs g tev kenys g megtilt s ltex.pdf \(kimittud.hu\)](#)

<sup>72</sup> Decision No NO/HGO/195-3/2024. of the Waste Management Department of the Department of Environment, Nature Protection and Waste Management of the Nógrád County Government Office. <https://drive.google.com/file/d/1zJaww5ZAu0piZqXs5kbX8Tx-FQLeCYXo/view>

activities on the factory premises, but its own waste management facilities are operated by Éltex under a lease agreement" (p. 30).

The amount of scrap batteries will increase significantly in the future due to the expansion of new factories. The installation of a new production line generates a lot of battery waste due to machine set-ups, and until the product is approved by the customer car manufacturer, all batteries - even good quality ones - have to be scrapped. Years later, a lot of used batteries are generated (see Győrffy, 2023a, for more on recycling problems).

**Table 4: Main hazardous waste generated at Samsung SDI (over 1,000 tonnes), kg**

HAK code	Name	2018	2019	2020	2021	2022
15 01 10*	packaging waste contaminated with hazardous substances	217 347	850 328	1 305 008	2 060 460	2 677 145
16 10 01*	aqueous liquid waste containing hazardous substances	2 479 823	16 691 965	19 868 005	27 739 272	27 971 360
19 02 05*	sludge from physico-chemical treatment containing dangerous substances	275 830	437 440	1 020 720	1 383 460	1 559 680
19 08 13*	other treatment of industrial waste water, hazardous substances	-	-	-	3 993 140	2 537 280

Source: 'Samsung SDI Waste Management Plan, 2023-2027', October 2023, page 5.

Waste batteries account for only a fraction of the hazardous waste from cell production. For example, as *Table 4* shows, in the case of Samsung, 80 per cent is "aqueous liquid waste containing hazardous substances", more than half of which is aqueous NMP. Some of this is recycled by the Korean-owned company JWH in Komárom (JWH, which uses huge quantities of NMP, did not need an environmental impact assessment), while about 20 per cent is a suspension containing NMP and cathode-side materials such as cobalt and nickel. This cannot be recycled at present, so unknown to us, external waste handlers are transporting about 5,600 tonnes of highly toxic waste from one plant alone to unknown destinations each year (Living, 2024). The technological, capacity and transport-related disaster risks of the recovery process for the aqueous NMP waste to be recycled are not being investigated by the authorities in any meaningful way, and the technologies used are not being monitored (MMKKT, 2024).

With the arrival of Chinese cell factories, the amount of NMP used and supplied will increase dramatically. CATL's permits in Debrecen state that they use 2000 tonnes of NMP solvent per year, which is very low compared to the 17-22 thousand tonnes used by the Korean plants. It is only from a gap-filler (35900/8170-1/2022) that it appears that the CATL plant uses 45 000 tonnes of regenerated NMP in addition to the new 2000 tonnes for cell production (but all of it is fed into the system at the beginning), and that 48 300 tonnes are listed as output, and although the figure is not correct, the permit has been granted.<sup>73</sup> The permits also show that CATL will outsource NMP regeneration for the first months of operation. Eve Power and the Sunwoda cell plant will also use thousands of tonnes of NMP. Water pollution by the Chinese company Halms Hungary for negligent handling of hazardous substances in Debrecen has so far been reported, with a fine of HUF 1,980,000 including multipliers (HB/17-HGO/00957-6/2024), based on an old 2001 regulation<sup>74</sup> (where the maximum basic fine is HUF 24,000).

## **Summary, conclusions**

The picture that emerges from the above shows that forced battery sector development in Hungary poses significant problems in several respects. The necessary conditions (energy, water, labour) are not yet in place to develop the industry on such a scale, and the costs of creating them are enormous. However, this article also highlights the problems with the regulatory framework for licensing and operation. The old legislation has not yet been adapted to this huge battery industry, despite five years of significant domestic production and exports by South Korean factories and their mainly Asian suppliers. For example, when imposing fines, the authorities had to take into account the fixed amounts set 13-31 years ago, which have no deterrent effect.

The large companies are now subject to environmental permits (which are often hastily issued, not thorough enough and are subsequently modified several times), but not the smaller related companies that also work with toxic substances (electrolyte plants, copper foil plants, NMP regeneration plants). The large companies will get the environmental permit anyway, no matter how unclear the treatment and quantity of waste or waste water is, for example. On paper, their operations are therefore legal (the case of Samsung is an exception from April 2024, because it has not been stopped or restricted despite a court order).

Despite the existence of strict legislation in many cases in line with EU standards, centralised authorities are not only lenient in their treatment, but also violate the

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<sup>73</sup> <https://greenfo.hu/blog/2x245-az-nmp-rejtely/>

<sup>74</sup> Government Decree No 271/2001 (XII. 21.) on the amount of waste management fines and the method of their imposition and assessment

legislation in force in the interests of companies themselves, in obedience to the central will. In addition, the authorities are understaffed and underfunded, and cannot carry many controls. The authorities provide the public with as little information as possible, and decisions imposing fines and the documents authorising factories are either not posted on government websites, or are posted for very short periods of time, almost hidden away and not searchable. Sometimes, a local authority (e.g. disaster management) may suggest or warn of stricter measures. In such cases, this is either brushed over at government level or resolved with the help of an expert, so that a decision in favour of the companies is taken. Irregularities in battery production and waste management are not only committed by Asian factories, but also by Hungarian companies. The inertia of the authorities is also evident here.

The central National Environmental Information System, which is supposed to be up to date, partly cannot be used for five years because it is under development. In other areas, there are significant delays in updating the data, but only two years lagged data are available. Moreover, the data in the system are incomplete because factories can choose not to comply with their reporting obligations.

In the absence of effective external control, factories can also indulge in many irregularities in their operations. They are sometimes fined, but only minimally in relation to their turnover. In addition, government decisions in 2023 will provide state legal instruments to facilitate the operation of firms and reduce transparency. All indicates that, despite the rhetoric, environmental protection is the last consideration in the location and operation of these factories. The favourable legal environment applied to the battery industry is promoted to foreign investors by the Hungarian Investment Promotion Agency (HIPA) on its website. Unlike in other European countries, the lax regulation is a competitive, localisation factor that benefits only small groups of people, not the country as a whole.

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