

## What is our Engagement about?

Our civil organization Social Promotion Association (APS) Save Lake Varese was founded in 2019, headquartered in Bodio Lomnago, with the aim of creating a community of people who are motivated to restore the diseased Lake in Varese.

Although Lake Varese may only be one of the many waters in the Province of the Seven Lakes in Northern Italy, we nevertheless have a duty to protect its natural, aquatic and wildlife heritage. By joining forces and resources we can change things. When many people make a small gesture, history shows that big changes are possible.

Initiatives of this kind, which started with civilian engagement, were successful throughout Europe; for example, in neighbouring Switzerland, civil initiatives were able to bring their lakes back into optimal conditions for the ecosystem, the territory and the economy. We don't want to hide behind the usual excuses like: "nothing changes that way", "nothing can be done", or: "even if I do something, that will not help". We know that instead we can achieve great results together and our commitment is important. In the following text we would like to explain in detail what this commitment is about and to convince you to join us in saving Lake Varese.



Figure 1 - Lago di Varese 2020 (Dietz/APS)

### The Lake Varese in Lombardy

First, we want to underline the importance and potential of Lake Varese for its surroundings and how many people are directly and indirectly influenced by its condition.

Italy is well known to be blessed with beautiful landscapes. The country has more than 2000 lakes. Considered to be located in the most important Italian lake district in northern Italy<sup>1</sup>, Lake Varese belongs to the Province of the same name<sup>2</sup> at the foot of the Alps in the

north of Lombardy.<sup>3</sup> This body of water is unique for its picturesque landscape at the foot of

<sup>1</sup> Premazzi et al. 2003: 47.

<sup>2</sup> Premazzi et al. 2005:123.

<sup>3</sup> Gazzola et al. 2018: 6.

Monte Campo dei Fiori and ranked 10<sup>th</sup> place among the most beautiful Italian lakes. Its basin of glacial origin resulting from the melting of the ice in the Verbano areas. The main tributary is the Brabbia River, while the main envoy, the Bardello River, flows directly into Lake Maggiore.<sup>4</sup> The basin is bordered by basins of other lakes (Maggiore to the west, Lugano to the north and Como to the east.<sup>5</sup> With the keyword *Bodio Lomnago* latest pictures of the location can be looked up on the homepage Earthstar Geographics.<sup>6</sup> With a mean depth of 11 m, a maximum depth of 26 m, and a surface area of 14.8 km<sup>2</sup><sup>7</sup> this lake is described as relatively small<sup>8</sup> and shallow. Situated with an altitude of 236 m above sea level<sup>9</sup> and a few km from the city of Varese with a catchment area about 115 km<sup>2</sup><sup>10</sup> with up to 700 inhabitants/km<sup>2</sup>, it has one of the most densely populated areas in Italy.<sup>11</sup> Nine municipalities called "the banks" are located around its coast: Varese, Gavirate, Bardello, Biandronno, Cazzago Brabbia, Bodio Lomnago, Galliate Lombardo, Azzate and Buguggiate.<sup>12</sup>



Figure 2 - Lago di Varese 2018 (Chiodetti/APS)

Thanks to its natural and cultural resources<sup>13</sup> as well as a temperate subcontinental climate<sup>14</sup> this area gets a lot of attention as a holiday and vacation destination. For example, in September 2013 and June 2015 the rowing world championships were held on site of Lake Varese and a cycle path was installed for boosting cycling

tourism.<sup>15</sup> The territory is also associated with successful industrial and commercial activities<sup>16</sup> (e.g. aviation and footwear production) with noted production complexes (e.g. Ignis, Aermacchi, Augusta) as well as an active fishery.<sup>17</sup>

<sup>4</sup> Wateronline 2016.

<sup>5</sup> Bettinetti 2018: 5.

<sup>6</sup> Earthstar Geographics. 2021.

<sup>7</sup> Chirico et al. 2020:3.

<sup>8</sup> Premazzi et al. 2003: 48.

<sup>9</sup> Chirico et al. 2020:3.

<sup>10</sup> Bettinetti 2018: 5.

<sup>11</sup> Premazzi et al. 2003: 48.

<sup>12</sup> Wateronline 2016.

<sup>13</sup> Gazzola et al. 2018: 6.

<sup>14</sup> Bettinetti 2018: 5.

<sup>15</sup> Wateronline 2016.

<sup>16</sup> Premazzi et al. 2003: 48.

<sup>17</sup> Wateronline 2016.

In summary, the densely populated lake in the picturesque location on the edge of the Alps has been a source of profit for the entire region, as a center of attraction for leisure activities and tourism, as well as its productive economy for centuries.

### The Condition of the Lake

The current state of its water does unfortunately not make it possible to fully exploit the economical or leisure potential for the local residents nor does it seem to be in a healthy state environmentally speaking.



Figure 3 - Lago di Varese 2018 (Dietz/APS)

The surface of the lake is currently described by ASP as „covered with slime, foam and dead fish, accompanied by the bad smell of decay“<sup>18</sup> and in 2015 a turn of the watercolour to an unusual yellowish tone was recognized temporarily.<sup>19</sup> The decisive role for this unsightly appearance is played by bacteria, which are spread all over the

globe: the blue-green algae. In technical language these microorganisms are called Cyanobacteria.<sup>20</sup> Mass populations of these can constitute scum, biofilms or mats<sup>21</sup> which can be seen on the surface of Lake Varese nowadays. A shift towards cyanobacteria dominance in its water was observed from 2010 onwards<sup>22</sup> with the result of cyanobacteria bloom events occurring every year during the summer and early autumn.<sup>23</sup>

These Algae bloom excessively under certain conditions, which we want to introduce here briefly for a better understanding overall. Algae bloom is part of the process of eutrophication. It begins with the increased load of nutrients in water's phosphorus in a concentration of more than  $50 \mu\text{g L}^{-1}$ <sup>24</sup> and enriched total nitrogen.<sup>25</sup> It sets off a chain reaction in the ecosystem, starting with an overabundance of algae and plants, which use up oxygen until a hypoxic state

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<sup>18</sup> APS 2020a.

<sup>19</sup> Wateronline 2016.

<sup>20</sup> Codd et al. 2017:3.

<sup>21</sup> *ibid*:4.

<sup>22</sup> Chirico et al. 2020:15.

<sup>23</sup> *ibid*:2.

<sup>24</sup> Humbert & Fastner 2017: 12.

<sup>25</sup> Chirico et al. 2020:2.

of the water. When Algae grow so massively, it blocks sunlight causing the other plants to die due to it's lack. These dead plant matters decompose, and the digestion by bacteria is using up any remaining oxygen. At the same time, they are producing large amounts of carbon dioxide. This lowers the pH of lake or sea water, a process known as acidification. This state of water can kill fish, other aquatic animals and further plants and, in the worst case, creates dead zones in water.<sup>26</sup>



Figure 4 - Lago di Varese 2020 (Dietz/APS)

Lake Varese is one of the first and most glaring example of eutrophication in Europe.<sup>27</sup> As expected in eutrophic environments, cyanobacteria were overrepresented in the lakes phytoplanktonic community, accounting for more than 50% of the total cell abundance on average.<sup>28</sup> This development is man-made and not just a consequence of natural processes. Such mass populations of Cyanobacteria can occur in pristine bodies of water, uninfluenced by human

activity, where water enrichment with the nutrients necessary for cyanobacterial growth occurs via natural geological and hydrological processes. However, it is recognised today that the increase in these favourable conditions for the blooming of a body of water is particularly susceptible to anthropogenic pressures.<sup>29</sup> The further increase of human activities in the area accelerated the degradation of its water quality.<sup>30</sup> An overload of organic matter from a massive amount of fertilizers and nutrients, especially phosphorus, which comes from the anthropogenic discharges of the population that have accumulated on the ground over the years, is polluting Lake Varese today.<sup>31</sup> Nutrients from food and the release of excreta generates immense nutrient flows in areas of high population density, even where modern sewage treatment technology is applied.<sup>32</sup>

By the end of the 1980s, a system of wastewater bundling measures was taken as a solution for Lake Varese. The Comabbio-collector transported the municipal wastewater to a sewage treatment plant in Gavirate.<sup>33</sup> This sewage system is outdated and often overloaded by floods,

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<sup>26</sup> National Ocean Service 2021.

<sup>27</sup> Chirico et al. 2020:2.

<sup>28</sup> *ibid*:6.

<sup>29</sup> Codd et al. 2017: 4.

<sup>30</sup> Chirico et al. 2020:2.

<sup>31</sup> Wateronline 2016.

<sup>32</sup> Jeppesen et al. 2010: 119.

<sup>33</sup> Wateronline 2016.

clogged and then discharges the excess sewage into the lake's tributaries such as Tinella and Valle Luna.<sup>34</sup> There are currently two types of polluting discharges: sewage from different municipalities (Gavirate and Varese), that are not connected to the sewage distributor, and the unofficial illegal sewage. It is also caused by all adjoining communities having no separation of river water and wastewater management. Large amounts of rainwater overload the collector and spill sewage water. The indirect consequence of the malfunction of the collector was the multiplication of algae,<sup>35</sup> which is still not stopped until today. Considering the negative impacts of cyanobacterial blooms on ecological, economical, and human health, their monitoring and forecast is of paramount importance for lake management.<sup>36</sup>

By producing a wide range of harmful toxins<sup>37</sup> with several consequences for the environment and the people living around the lake, the side effects of massive algae blooms reach far beyond a restriction of aesthetics. Many algae can form blooms, and 200 or more of these produce secondary metabolites that are hazardous to wildlife and humans.<sup>38</sup>

### Economic, Environmental and Health-Endangering Consequences

The massive bloom of cyanobacteria can adversely impact the available and aesthetic quality of water resources for human's indirect or direct use. This includes economic and basic needs as well as touristic and leisure water-based activities.

Cyanobacteria pose a risk to human health by producing cyanotoxins (that includes hepatotoxins, neurotoxins, cytotoxins, and dermatotoxins). These toxins are negatively impacting not only the survival of aquatic organisms, but also wild and domestic animals and humans, leading to public health concerns<sup>39</sup> of both acute and chronic effects.<sup>40</sup> The harmful impact of cyanobacterial blooms has existed for thousands of years, but only recently, these health impacts are becoming more frequently detected and reported.<sup>41</sup> Microcystins are the toxins most frequently produced by freshwater cyanobacteria. They were shown to be potent tumour promoters, endocrine disruptors, and immunotoxicants. They can also induce oxidative DNA damage and genotoxicity.<sup>42</sup>

When it comes to measuring the toxicity of water and acute tolerable daily intake (TDI) limits for these substances, it has to be carefully considered that various cyanotoxins coexist in

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<sup>34</sup>Varesenews 2016.

<sup>35</sup> Wateronline 2016.

<sup>36</sup> Chirico et al. 2020:2.

<sup>37</sup> ibid:1.

<sup>38</sup> Christoffersen & Kaas 2000: 1212.

<sup>39</sup> Chirico et al. 2020:1.

<sup>40</sup> Christoffersen & Kaas 2000: 1212.

<sup>41</sup> Hilborn & Beasley 2015:1374.

<sup>42</sup> Catherine 2017:112f.

water.<sup>43</sup> The threshold for any health alert in recreational waters is normally defined by cyanobacterial density in many countries, although the regulated threshold varies at national level. A density of 100,000 cyanobacterial cells per ml is a common guideline for a moderate health alert in recreational waters.<sup>44</sup> In Lake Varese Cyanobacteria were detected with a median density of 362,000 cells per ml.<sup>45</sup>

It is not to forget that there are several exposure routes of cyanobacteria and cyanotoxins. An oral exposure route is drinking of raw lake water by animals or children or by frequently accidental swallowing tiny amounts during water-based activities. Another route is the consumption of fish or plant foods, which were watered or spray-irrigated with the lake water. Spray is also dangerous in terms of skin and mucosal contact or even inhalation during recreation or work practices. The same problems occur when showering. Inhalation of dust particles from air-dried and lyophilised cyanobacterial biomass can also become a problem. Understanding the significance of dermal and inhalation exposure to spray, aerosols, or dust is less advanced than that via ingestion, although these routes may be predominant in some recreational and occupational situations. Most risks shown above can be applicable for inadequately treated water<sup>46</sup> since toxins from contaminated lakes can under certain conditions percolate and contaminate groundwater over time.<sup>47</sup>



Figure 5- Lago di Varese 2018 (Dietz/APS)

The already imposed swimming ban combined with poor water conditions, unpleasant smell and the sight of a lake covered with algae already resulted in a human and capital gap that over time weighed on the market and economies and continues to do so. Understanding the economic significance of the impact, the Vareses lake's poor fish quality meant a decline in the lake fish trade to the point of almost complete

disappearance.<sup>48</sup> Responsible is the anoxia caused by the decay of the cyanobacteria biomass.<sup>49</sup>

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<sup>43</sup> vgl. *ibid*: 115.

<sup>44</sup> Chirico et al. 2020:14.

<sup>45</sup> *ibid*:6.

<sup>46</sup> Codd et al. 2017: 6f.

<sup>47</sup> Catherine et al. 2017: 115.

<sup>48</sup> Wateronline 2016.

<sup>49</sup> Chirico et al. 2020:1.

When it comes to tourism, environmental resources are those tangible elements that can significantly matter for its development. Tourist coming to Varese for cycling are interested in unspoiled environments that are far away from polluted areas and offer interaction with nature and its biodiversity. Hence environmental conservation enables the maintenance of biodiversity, a primary source for tourism success.<sup>50</sup> Healthy landscapes are also important for recreational activities by residents.

Considering these negative impacts of cyanobacterial blooms on ecological, economical, and human health at the local level, the paramount importance for immediate action of the lake's management is inevitable.

### Why our Local Engagement goes beyond Lake Varese

The problems of Lake Varese is not only relevant for its immediate local area. It makes sense to look at the case of Lake Varese in the global framework of climate change including upcoming problems of draughts and water scarcity. We want to underline that the Varese Province is “not alone” with these challenges, but that it is absolutely vital to take the clearly visible red flags serious, with the cyanobacteria bloom being only the beginning. If the effects of climate changes become dangerous, as many problems as possible should have already been addressed. The countries and the relevant institutions must inform, prepare and support one another. The negative effects on water and all related areas must be protected for the sake of the common good.

### Effects of Climate Change

The phenomenon of climate change interacts with eutrophication, acidification, and toxic substance contamination.<sup>51</sup> The consequences of eutrophication in many of the world's waters has already become a widespread threat to water supply, human health and amenity, as well as for nature conservation.<sup>52</sup>

Climate change also affects Lake Varese and aggravates its current condition. For example, an increase of annual median temperature of about 2°C from 1960 to present has been observed in the Po River Basin area, where Lake Varese is closely located. A further increase close to 3-4 °C at the end of the century is forecasted.<sup>53</sup> Warm water holds less oxygen. Enhanced oxygen depletion and the risk for sensitive species as well as increase nutrient release from sediments

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<sup>50</sup> Gazzola et al. 2018: 7f.

<sup>51</sup> Nickus et al. 2010: 38.

<sup>52</sup> Jeppesen et al. 2010: 119.

<sup>53</sup> Pedro-Monzonís et al. 2016: 249.

can be a consequence. Such temperature-induced changes are expected to interact strongly with existing increased nutrients.<sup>54</sup> Warming waters also intensify the vertical stratification and lengthen the period of seasonal stratification, which is also one of the main physical variables determining the occurrence of algal bloom outbreaks. The increasing global air temperature may increase the strength and depth of stratification. In addition, it has been shown that the meteorological variables as air temperature, wind speed, and relative humidity, could be drivers of hypolimnetic anoxia.<sup>55</sup> And due to climate change and eutrophication the aquatic productivity of carbon dioxide (CO<sub>2</sub>) and methane (CH<sub>4</sub>), both potent greenhouse gases (GHG), will also increase over the next century. Even though absolute emission of CO<sub>2</sub> is 5–10 times more than that of CH<sub>4</sub>, about 72% of the climatic impact of GHG emissions from lakes and impounded waters is due to CH<sub>4</sub>. This is because CH<sub>4</sub> is up to 34-times more potent as a GHG than CO<sub>2</sub> and is responsible for approximately 20% of the overall additional atmospheric radiative forcing observed since 1750.<sup>56</sup>

But Lake Varese is just one example of thousands of other stretches of waters, where these changes are already visible. The number and intensity of Cyanobacteria Bloom increased globally over the last decades.<sup>57</sup> Cyanobacterial Blooms and Cyanotoxins grew in relation to human influence on water resources and climate change with a rapidly growing human population and the influence of human activities (agricultural, urban, and industrial). Climate change also appears to have negatively affected ecosystems and ecosystem services, including provisioning (water, crops, food, energy) and supportive services (water and nutrient cycling, habitat provision). Further projected changes including human migration and European desertification would exacerbate the pressures on the availability, quality, and safety of water.<sup>58</sup> The World Resource Institute ranks Italy in the second highest risk categories of future water scarcity already<sup>59</sup> and the region of Lake Varese is unfortunately not immune if climate change leads to problems of water scarcity and political conflict.

Global warming indicates an increased likelihood of droughts that directly influence water resources availability. The combination of long-term change (e.g., warmer average temperatures) and greater extremes (e.g., droughts) can have a decisive impact on water demand, with further impact on the ecosystems. Under all climate change scenarios in the Mediterranean region, available water resources decrease while irrigation demand increases<sup>60</sup>.

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<sup>54</sup> Jeppesen et al. 2010: 119.

<sup>55</sup> Chirico et al. 2020:2.

<sup>56</sup> Beaulieu et al. 2019: 1f.

<sup>57</sup> Chirico et al. 2020:1.

<sup>58</sup> Codd et al. 2017: 7.

<sup>59</sup> World Resources Institute. 2019.

<sup>60</sup> Iglesias 2007:781.



The Po river basin where the Lake Varese is near to, is one of four of the major European river basins where the Alps function as a water holding tank so to speak. A climate change-induced shift in mountain hydrological regimes and the future predicted disappearance of Alpine glaciers at the end of this century will have consequences for water management in the water-dependent lowlands. Major impacts in Danube, Rhine, Rhone and Po river basins are foreseen.<sup>61</sup> It is also forecast that the high population density areas and economically important industrial regions and vast agricultural plains have to cope with a reduction in water availability during the season of peak demand with important socioeconomic implications.<sup>62</sup>

Water scarcity can cause political hostilities. Most Mediterranean freshwater and groundwater resources are shared among countries. Water sharing between administrative regions is also common. Disputes especially during drought conditions will probably increase as a result of an imbalance in the distribution of water.<sup>63</sup> We will face a geopolitical challenge. On the one hand, the importance of sharing experience and knowledge that is generated by the successful implementation of environmental protection projects and making it available to others is emphasized. For instance, The European Climate Adaptation Platform (Climate-ADAPT) was put in place to enforce and strengthen cooperation at the transnational level in form of knowledge centres and networks to provide an overview of information about the policy frameworks and initiatives. Engagement for dissemination, awareness-raising, capacity building, networking and cross-country exchange is needed as well as implementing actions on the ground.<sup>64</sup>

On the other hand, it will be increasingly necessary for waterbody managers (potable supply, recreation, aquaculture, irrigation) and health authorities to address the problems presented by cyanobacterial mass populations, using reactive and proactive strategies<sup>65</sup> to avoid letting water resources becoming unusable locally.

### Which Challenges do we have to adress?

We suggest seeing the current situation as a warning signal but also as an opportunity. A challenge for many seems to be aware of his or her own power to act and see the global situation reflected on a small scale in their immediate area of life. Lake Varese offers the ideal starting point for locals to become politically engaged and to make a helpful contribution as we do in our association. Not only world science or institutions, but also civil society movements (such

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<sup>61</sup> Vanham 2012: 197.

<sup>62</sup> *ibid*: 204.

<sup>63</sup> Iglesias 2007:781.

<sup>64</sup> EEA. 2018: 5f.

<sup>65</sup> Codd et al. 2017: 7.

as Fridays for Future) demand cultural, social, political, economic and ecological influence. The debate about the environment and our future takes place in and around people's heads and institutions, about their values, goals and needs and about the legitimate and necessary means to implement change.<sup>66</sup> It may not be possible to solve the global problem of climate change as an individual, but it is manageable to get together, start in its own home and drive conscious change. Our association believes in contributing to the global problems of climate change by finding solutions for the local problems of Lake Varese.

Necessary action for improvement of water management is not only an urgent matter in Varese, but in several parts of Italy and face political, cultural and practical hurdles. In our point of view the consistent non-action on environmental issues, with the spread of misinformation, flawed spending of funds and the overall lax attitude toward environmental issues on the part of politics is our biggest challenge.

### Environmental Law Violation in Italy

Lake Varese is not an exception when it comes to unfiltered wastewater which drains into public waters in Italy. Drains that go straight to the water due to a lack of functioning sewers is a common problem. 25% of wastewater is discharged into the sea, lakes and rivers without being properly cleaned.<sup>67</sup> To tackle the problem there are several European legislative actions for the protection of water that the member state Italy already had agreed on. An example is the Legislation of the European Community for directives on water quality, binding for all of Europe. The fourth convention point especially advocates the protection of municipal water and its quality from an environmental point of view:

“Le acque comunitarie subiscono pressioni sempre maggiori a causa del continuo aumento della domanda di acqua di buona qualità in quantità sufficienti per qualsiasi utilizzo. Il 10 novembre 1995, nella relazione "L'ambiente nell'Unione europea - 1995", l'Agenzia europea per l'ambiente ha presentato una relazione aggiornata sullo stato dell'ambiente, nella quale confermava la necessità di intervenire per tutelare le acque comunitarie sia sotto il profilo qualitativo che quantitativo.”<sup>68</sup>

18 years after the law was designed, the European Commission had to point out that Italy does not properly perform its duty to ensure that urban wastewater is adequately collected and treated. The violation of the Urban Wastewater Treatment Directive, Council Directive 91/271/EEC by 237 agglomerations in 13 Regions including the region Lombardia are in breach of several provisions of the directive. In addition, the Commission urges Italy to submit further

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<sup>66</sup> Roos 2020: 3f.

<sup>67</sup> Terra Nuova. 2016.

<sup>68</sup> European Union Law. 2000.

clarifications on all agglomerations declared compliant by the Italian authorities, but evidence gathered by the Commission indicates the opposite. This causes significant risks to the environment and human health in many agglomerations. The Commission opened the infringement procedure by sending a letter of formal notice to Italy. In the absence of a satisfactory response, the Commission may decide to refer the case to the Court of Justice of the EU.<sup>69</sup>

Regarding Lake Varese, the Lombardy region provided the European Environment Agency with incorrect data on water quality,<sup>70</sup> a mistake, so the public statement later.<sup>71</sup> As per Dorothea Dietz, the founder of APS, criminal law proceedings were starting against Italy because of the disregarded EU guidelines on environmental protection. Such legal disputes cost a lot of money that should be invested in constructive projects instead and hence APS tries to get closely involved in these issues. The Italian environment minister told Dietz in private that the country in general is overwhelmed by the strict EU control guidelines and barely able to participate in application for EU funds. But even if funds are available, a misspending of money for centuries is another problem we want to stress, when it comes to actively clean up Lake Varese and may be exemplary for other Italian regions too.

### Poorly invested Funds for cleaning Lake Varese

Environmental work is closely linked to the approval of the local authorities. However, in perspective of the APS they cannot or do not want to invest the necessary financial resources effectively. The best evidence is the ineffective spending of funds over decades when it comes to Lake Varese.

Expert and Ichthyologist Pietro Ceccuzzi, who wrote both his bachelor's and master's thesis on the lake has the impression that over the years public funds have been invested in projects to such an extent that the lake should have long been one of the cleanest and most usable in Europe. Many projects were proposed for the rehabilitation of the lake. Some never got approved, others started and failed in a short period of time while others worked with good results but got also shipwrecked in bureaucracy and a lack of money.<sup>72</sup>

Already in the 1950's, the spread of industrial complexes as well as the careless dumping of untreated water into the lake changed the chemical-physical composition of the lakewater to considerable algal blooms and fish deaths. This solution back then was an implemented sewer

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<sup>69</sup> European Commission. 2019.

<sup>70</sup> EAA 2019.

<sup>71</sup> APS 2020b.

<sup>72</sup> Varese news 2016.

system, launched between 1986 and 1988, that is still in use. This system had significantly and effectively improved the health of the lake by reducing previous external pollution for a while. However, increasing water volumes and further pollution made it impossible to make the collector a sole measure for keeping the lake in a clean condition. Since then, a rather surprising chain of mismatched solutions were applied. To name some, there was an Oxygenation project between 2000 and 2003 which tried to counteract the anoxic state through oxygen enrichment. It was unfeasible and too expensive. Another attempt was the project “Containment of Eutrophication” between 1995 and 2004 which devoured huge sums of money for the management and control work of the existing distributor without any significant effects.<sup>73</sup> The project of Ispra JRC in the late 1990s and early 2000s, which provided for the oxygenation of shallower waters and the pumping of deep waters was also discontinued due to high costs.<sup>74</sup> In 2004 the use of “Phoslock”, a modified clay which can remove the phosphorus dissolved in the water and reduce its release was introduced by the company “Phoslock Europe GmbH”. But this project was also abandoned due to the high costs and the chemical composition of Phoslock, which is characterized by high doses of lanthanum, a toxic metal.<sup>75</sup> A pilot study performed in 2009 about the reduction of the loading by applying a lanthanum-modified bentonite clay to bind the element showed a sharp reduction (more than 80%) of the P concentrations along the water column during 2009–2010. However, the trend seems to be reverted with an increase of the cyanobacteria during the 2011–2014 years.<sup>76</sup>

Attilio Fontana, President of the Lombardy Region signed the 2019 Coordination Agreement for the Territorial Development of the Framework Agreement (AQST) for the "Security and Control of Lake Varese" and Raffaele Cattaneo Chairman of the State Environmental Council for Environment and Climate, and all the Administration of the Province of Varese promised cooperation to reach this goal for finding a solution until 2021 with a spending of 6 million Euros (according to Dietz, the sum meanwhile increased to 10 million). Thousands of kilometres of sewerage of the network should be rehabilitated, over two hundred overflows and the still hidden illegal water inflows should be spotted.<sup>77</sup> Until today there was unfortunately no mentionable progress made since.

Experts on this topic express suspicion that impossible model solutions in the past have often been proposed, as this is useful from a political point of view, a conspicuous action that can

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<sup>73</sup> Wateronline 2016.

<sup>74</sup> Varesenews 2016.

<sup>75</sup> Wateronline 2016.

<sup>76</sup> Chirico et al. 2020:12.

<sup>77</sup> LuinoNotizie. 2019.

bring approval and sympathy, but does not work in the long run.<sup>78</sup> Ceccuzzi sees the root of the problem at the level of public institutions, and its few measures due to power struggles and manias of protagonism and image reasons. This would have wasted resources and time. The communities could not have agreed either on where or how the resources should be spent. Parochialism would be an obstacle especially among the small communities around the lake. Politicians, administrations, universities and experts need to work together to tackle the challenge of cleaning the lake otherwise there will be no success,<sup>79</sup> which is needed urgently. Several solutions like the separation of wastewater, removal of phosphorus, bypasses of some sewers including smaller hydraulic works have already been made.<sup>80</sup> Practical and immediately applicable solutions are more urgent than ever.

### How do we initiate Change

We decided not to stay silent about these issues. The goal of our association is to encounter the lack of intervention and concrete policy choices to provoke action for the lake by bringing together civilian people and experts. Thanks to today's digital technology, social networks, and the Internet, we can easily create a community of people who together inform and put pressure on political administrations and institutions to take on effective measures and make the necessary changes finally.

It is important that everyone understands what this situation means both regionally and globally in terms of climate change and that we are responsible for taking action as soon as possible.

Our strategy is to raise awareness to the harmful effects of the lake's environmental situation on the economy and its locals. In this regard we promote educational activities, conferences and public meetings in schools to inform the directly affected population. The necessary contacts have already been acquired and the projects will come into effect as soon as the pandemic of Corona is abided.

Another important facet of this approach is the fostering of our official website to share educational scientific articles. Further we strive to puplicate in media such as newspapers (eg. Corriere della Sera, La Prealpina, Fanpage) and other platforms like youtube<sup>81</sup> to reach a wider audience.

Moreover, our Association reach out to several Institution<sup>82</sup> appealing to the “European Idea”, looking for Cooperation with Austria and Germany in terms of knowledge transfer and

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<sup>78</sup> Wateronline 2016.

<sup>79</sup> Varesenews 2016.

<sup>80</sup> Wateronline 2016.

<sup>81</sup> fanpage.it.2020.

<sup>82</sup> Joint Research Centre 2019.

European funds to clean water. The experiences of other lakes with the same problem (solved so far) can teach us a lot about how to deal with our situation. In addition, we encourage the collection of donations to finance dissemination and awareness projects, as well as creating a fund that can support local projects. We are also examining how the institutions use the citizens' money to clean the lake so far and more importantly, in the future.

We know, and we have the proof that we can achieve great results together. Feel free to join our movement and to learn more on <https://www.savelakevarese.org/unisciti-a-noi/>.

Thank you for caring,

Your Social Promotion Association (APS) *Save Lake Varese*.



Figure 6- Aperitivo APS 2020 (Dietz/APS)

## List of References

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