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Industry Overview 2023

Environmental Business International Inc.

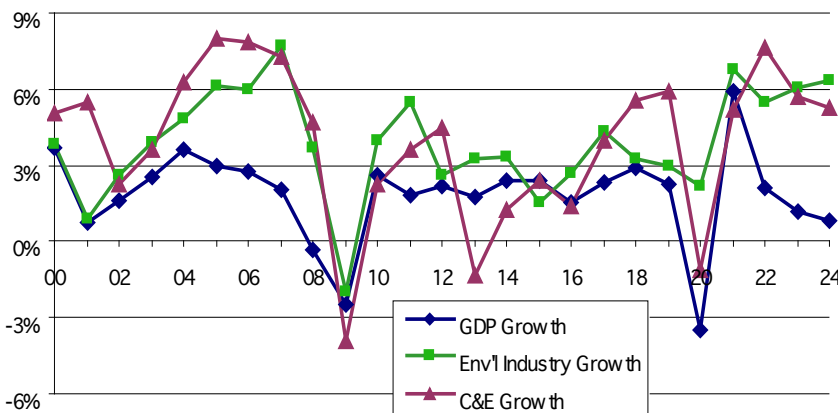
INDUSTRY UPSWING SUSTAINED IN 2023-24

The U.S. environmental industry grew 5.5% in 2022 to reach \$501.3 billion in annual revenues. The growth did not quite match that of the rebound year of 2021 at 6.8%, itself the highest annual growth rate since 2007. The year 2007 was the only year of environmental industry growth over 7% since the 1980s.

Steady growth across almost all industry segments since 2000, and a dose of recession resilience, has made environmental service companies even more attractive investments to the private equity capital that has helped raise the business prospects across the industry. (Environmental industry executives hope that the industry has also become more attractive to a new generation of engineering and managerial talent.) Environmental industry fundamentals and trends, however, are the more powerful forces guiding the current forecast and generally optimistic outlook amongst environmental companies and their owners and investors. The major factors behind the positive growth forecast scenarios:

- Infrastructure investment, funded largely but not solely by recent federal legislation;
- Accelerating energy transition and greenhouse gas emissions mitigation;
- Heightened awareness of climate risks and investments in climate resilience;
- Increased public, shareholder, government and financial community pressures on companies to manage and disclose their conduct, culture, risks and management and strategy approaches around ESG (environmental social governance), sustainability, corporate social responsibility and other regulatory or non-regulatory factors driving corporate performance and disclosure;

Annual Growth in the Environmental Industry, 2000-2024



Source: Environmental Business Journal. Annual research on the environmental industry by EBI Inc.

Inside EBJ: Environmental Industry Overview 2023

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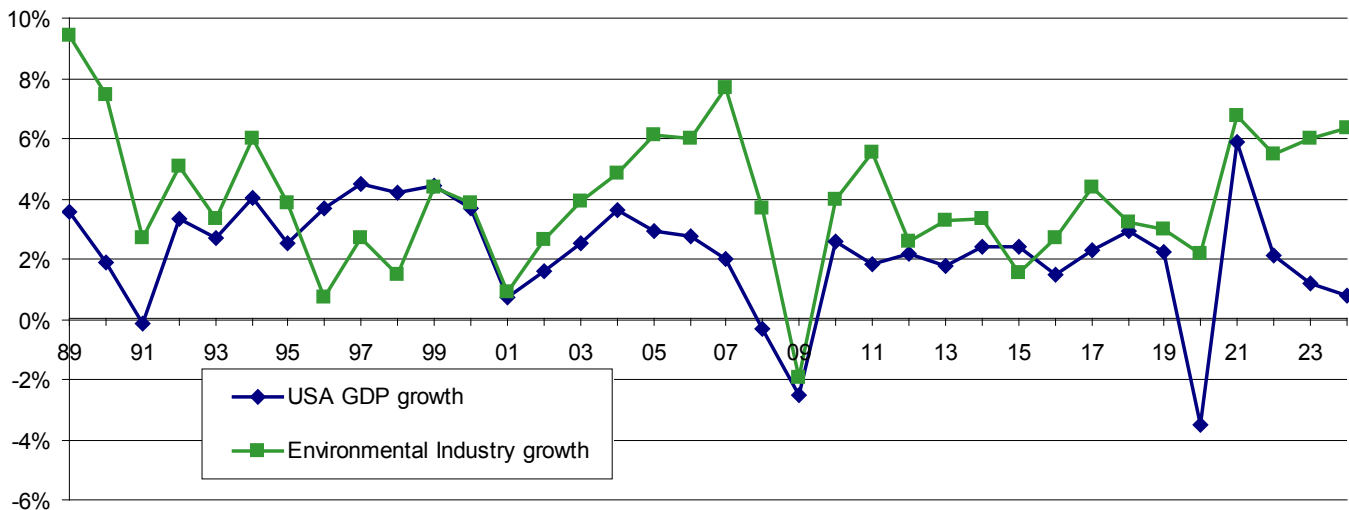
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Annual Growth in the Environmental Industry vs the U.S. Economy, 1990-2024



- Heightened awareness and pending regulatory implementation around PFAS and other emerging contaminants;
- Rapid movement of environmental data management, digitalization of project management and increasing utility of artificial intelligence platforms;
- Strong market demand for technology and services driving shortages in supply of qualified service providers and staff and opening up stronger prospects for rate and fee increases.

These factors, and accounting for the economic factors summarized on the tables on page 3, lead to a confident expectation that industry growth can be sustained at over the 6% annual rate for the next two years, and in the 5 to 6% range in 2025 and 2026.

35-YEAR INDUSTRY REVIEW

The long history of the environmental industry and trends impacting various segments provides a useful context, but does not always foretell the future. The 35-year history depicted on the graph above comparing overall environmental industry growth of the 14 segments with the growth of the US gross domestic product highlights some notable trends.

Prior to 1990 or prior to any real segment analysis, company by company information indicates that growth was pretty consistently way ahead of that of the economy in the 'core environmental service' categories of environmental consult-

ing & engineering, hazardous waste management, remediation and environmental testing. Infrastructure service segments in solid waste, drinking water and wastewater systems each represented relatively high growth functions that weren't posting double-digit growth rates, but had not yet exhibited the characteristics of maturity that they would experience in the 2000s.

The 1990s brought first a recession and then fairly rapid onset industry maturity in a number of segments where a decade or more of double-digit growth had led to a lack of business discipline or overcapacity, price pressures and competitive dynamics not experienced before in environmental services. This industry maturity and a slackening of demand throughout the 1990s contributed to environmental industry growth less than that of the econ-

omy almost up to the turn of the century.

Stronger economic growth, healthy capital markets, increased federal spending, oil & gas development and raising resource commodity prices along with similar trends in property development and property values led to an extended period of higher growth in the environmental industry throughout most of the decade of the 2000s. Higher economic growth also supported rate increases in water and waste that didn't have to be as dependent on volume growth to drive revenues. The Great Recession of 2009 impacted all segments but the environmental industry recovered perhaps faster than many expected at the time, partially due to recovery funding and increasing resource prices in the early 2010s. The rest of the decade saw environmental industry growth a point

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THERMAL REMEDIATION TECHNOLOGY GAINS TRACTION IN EUROPE & THE USA AND Footholds in Emerging Markets

Haemers Technologies Inc. (Brussels, Belgium), formerly TPS Technologies Inc., has been at the forefront of thermal remediation since 1989. The firm's groundbreaking low temperature thermal desorption fixed facilities revolutionized the industry. Having treated over 8 million tons of contaminated soil, Haemers Technologies shifted focus to advanced in-situ and on-site thermal conduction heating technologies, abandoning conventional rotary kilns. Over the past five years alone, Haemers Technologies has successfully executed more than 100 thermal projects globally, addressing diverse petroleum hydrocarbons, chlorinated compounds, and persistent contaminants such as pesticides, mercury, PCBs and dioxins and secured over 20 patents covering the innovations in thermal remediation.

Jan Haemers is Founder and CEO of Haemers Technologies. Jan holds three Master of Science degrees in mining engineering, geological engineering and hydrological engineering, in addition to a business administration degree from Solvay Business School INSEAD. He has been working in soil remediation since 1991. After he founded the company now called SARPI Remediation (1993), where he pioneered bioremediation, soil washing and thermal desorption, he started his own company in 1999, dedicated to thermal treatment. In 2001, he acquired the U.S.-based company TPS Technologies Inc. and started research and development for new thermal technologies. He is the main inventor of more than 15 patented and patent pending in situ thermal desorption technologies. Jan lectures on soil remediation at universities and engineering schools in Europe and is also R&D registered expert for various EU R&D programs (FP6, FP7; H2020). He spent his career bringing sustainable and circular technologies to market with many partner companies around the world.

EBJ: Thermal on-site remediation has continued to grow and seems poised to take more share in remediation markets worldwide. Given your long history, can you tell us about some of the “pain points” in developing, demonstrating, and marketing to get new technology into widespread use.

Jan Haemers: The main element that has supported the growth of onsite thermal remediation in the last 30 years is its efficiency and predictability. It is fast and can guarantee results. Pain points are that has been perceived as expensive and energy intensive – certainly for more conventional applications (e.g., rotary kiln, which I exited in 2007 after owning and operating 14 fixed and mobile units). For those, permitting issues and the perception of a large installation on site have also been seen as serious drawbacks. In general, because of the innovative nature of our technologies we have to overcome the ‘unproven’ perception, which is particularly true in very conservative industries such as construc-

tion and redevelopment.

EBJ: What are the differences between the U.S. and European remediation markets?

Haemers: In Europe, we have seen a strong R&D leap in energy consumption, with over 50% reduction in average energy consumption between 2000 and 2020 (from 600KWh/ton to less than 300KWh/ton for hydrocarbon soil, for example). This brings thermal at the same level that digging 20 feet deep and hauling 50 miles without even treating. Thermal has become very energy efficient, in particular when applied in thermal piles. This European angle of energy efficiency is now getting more and more traction in North America as well.

Another major difference I see between Europe and the United States is the landfill competition, which is still very popular in some states and almost non-existent in vast parts of Europe due to regulations and landfill taxes.

We start to see in Europe some public clients requiring minimal energy performances and excluding solutions which they see as non-sustainable, even if they are cheaper. It is just the beginning, but it is promising.

EBJ: With speed to closure likely a larger priority in development-driven remediation markets or corporate transaction markets, are these the best client areas historically for your company?

Haemers: Yes, clearly. This is the real sweet spot for thermal treatment, when time is of essence, as well as predictability. Being able to provide a clear guarantee on performance, timing and price is very valuable to any project developer or any M&A transaction!

EBJ: And has most of your work come through the consultant project manager community?

Haemers: Not really. I would say half of it comes indeed through the consultant project manager community, and the other half directly from end-customers who have developed internal expert teams and are managing their projects themselves. We see strong differences between North America (consultant/contractor driven) and Europe (where a mixed picture is seen, with some countries similar to the United States and others not really in the consultant/contractor model yet).

EBJ: Tell us about some of your successful partnerships and how you structure them and collaborate on project development and execution.

Haemers: We have developed several very successful partnerships with local companies around the world. In Denmark, for example, our partnership with Arkil is now more than 15 years on-going. It has been mutually beneficial as we have trained and supported Arkil for all thermal projects in Denmark and provided them with all expertise needed as well as any innovation. With those assets, Arkil has been very competitive in the Danish market and could tender and win more than a dozen in situ and on site thermal projects. For Arkil, it would have been impossible and uneconomic to develop those skills on their own,

and for Haemers it would not have made sense to develop execution and contracting skills in Denmark without being Danish. On an average thermal project, Arkil keeps between 80% and 90% of the added value, the balance being for Haemers' technology support and service.

EBJ: What steps are you taking towards advancing sustainable remediation principles in energy requirements and other aspects?

Haemers: We believe that sustainability measurements are essential in moving forward and that energy is an important part of it, albeit not the only one. Comparing apples and apples is the main challenge as we still see many instances where sustainability is used to compare solutions that provide different outcomes. For example, I have read several articles claiming that MNA [monitored natural attenuation] was more sustainable, according to a specific model, than ISCO [in situ chemical oxidation] or other alternatives since it caused less nuisance to neighbors, had almost no CO₂ impact and was very cheap. This is absurd! One must compare solutions providing the same performance, otherwise comparisons are flawed. With that logic, MNA would also be a more sustainable transportation mean even if it doesn't transport anybody to anywhere!

When it comes to serious comparisons, our approach is a RECAP metric: Rapid, Efficient, Climate-Friendly, Affordable and Predictable. With those criteria, one can truly compare solutions and see if all of those criteria are met, at least to a certain level. If any of those is absent, one cannot claim any sustainability at all.

For example a recent project was deemed very sustainable compared to alternatives (excavation and hauling off site) because it scored very high on those five criteria. It took a few months for the whole project, no contamination was left behind (which means that society can use the land as it sees fit and not be limited by residual contaminants), it consumed less energy than dig and haul (i.e., more climate-friendly), was cheaper and finally very predictable as results and timing were guaranteed.

EBJ: How would you describe market prospects for treatment of PFAS-contaminated sites in North America and Europe.

Haemers: For the first time in my 30-plus years career, I see the general public really moved by pollution in soil and groundwater. It is affecting everybody and therefore political pressure has been intense. I must stress that science is still working on many aspects of the PFAS understanding (toxicity, analytical methods, degradation patterns, etc.), but certain el-

When it comes to serious comparisons, our approach is a RECAP metric: Rapid, Efficient, Climate-Friendly, Affordable and Predictable. With those criteria, one can truly compare solutions... . If any of those is absent, one cannot claim any sustainability at all.

ments are already clear and technologies are available to tackle the most acute sites. Indeed, source zone (fire fighting platforms, factories, etc.) are the areas to be addressed immediately to stop the leaching and transfer into groundwater and surface water bodies.

Thermal desorption (eventually combined with soil washing for sandy and gravel soils) has now been widely proven by many vendors to be capable of tackling the soil and cleaning it to very low levels (low enough to no longer be considered as a source zone). PFAS are still not destroyed, as combustion/destruction patterns are still not clearly settled. However, thermal treatment can concentrate PFAS into a very limited volume (active coal or similar methods) for further treatment when consensus is reached on how to effectively destroy them.

So, I feel strongly about the market potential for PFAS treatment in soils, both in Europe and North America, albeit with regional differences in priorities.

EBJ: Please offer some perspective on remediation markets outside North America and Europe and where you see the best prospects for your technology.

Haemers: The main market outside of Europe remains China, but with strong issues about intellectual property. The remaining part of Asia is slowly opening up to thermal technologies, as dig and dump is more and more under pressure from NGOs. Major companies are still digging and dumping over 90% of their contaminated soil at very low cost, which makes it difficult to enter those markets with treatment technologies. However, a technology transfer model is making this easier and makes local companies partners rather

than competitors. I also see more and more regulators for South East Asian countries looking at Europe and North America to adapt their own regulations and move towards treatment rather than landfilling.

We see the African market still driven by oil and gas companies, if and when they are under pressure from NGOs.

Finally, South America is probably the most active market for thermal outside of Europe and North America, with Brazil playing a leading role driven mostly by M&A and redevelopment.

EBJ: What inspired you to get into this industry in the first place?

Haemers: I graduated as a mining engineer and geological engineer with the ambition to work in this business from the beginning (there was no environmental engineering in those days). Soil remediation standards and rules didn't exist in the late 80s in Europe, and we were literally writing the rules and defining standards! That is what attracted me: Seeing the issue, knowing there were no solutions yet, and helping come up with concrete solutions. To me that is the essence of an engineer's job!. □