



A catchment management experiences of the Evian natural mineral water (NMW) source site

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Abstract

The catchment management experiences of the Evian natural mineral water (NMW) bottling company were reviewed. Evian is among the leading brands of bottled NMW in France, exporting worldwide and becoming a role model for companies in many countries due to its long-term experiences in sustainably managing NMW source areas. Experiences of bottled water companies in France show that they are incessantly moving forward with proactive and advanced ideas to meet environmental challenges. For business sustainability, companies are dedicated to improving their environmental performance through effective and planned resource management. Evian has been working with the local community in a spirit of co-ownership to invent and preserve the water resource and fulfill its ambition of sustainable industrial functioning. The partnership aims to balance the protection of the NMW resource and sustainable agricultural development within the catchment.

Keywords: Natural mineral water, Evian, Catchment management, Local community, Partnership

에비앙 천연 광천수 수원의 유역 관리 사례

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요 지

본 연구에서는 천연 광천수 병입 회사인 에비앙의 유역관리 경험을 검토하였다. 에비앙은 전 세계로 수출하는 프랑스의 선도적 병입 광천수 기업으로, 장기간의 지속가능한 천연광천수 수원관리 경험이 많은 나라의 롤모델이 되고 있다. 프랑스 생수 회사의 경험에 따르면 환경 문제를 해결하기 위해 선제적이고 선진적인 아이디어를 끊임없이 제시하고 있다. 사업의 지속 가능성을 위해 기업은 효과적이고 계획된 자원 관리를 통해 환경성과를 개선하는 데 전념한다. 에비앙은 수자원을 개발·보존하고 지속 가능한 산업 기능에 대한 목표를 완수하기 위해 공동 소유 정신으로 지역 사회와 협력해 오고 있다. 이 파트너십은 천연광천수 자원 보호와 유역 내 지속가능한 농업 개발의 균형을 맞추는 것을 가장 중요한 목표로 삼고 있다.

핵심용어: 천연 광천수, 에비앙, 유역관리, 지역 공동체, 파트너십

1. Introduction

Natural mineral water (NMW) originates from underground

sources that are protected from pollution. It is of original purity and is characterized by its natural mineral and trace element content, which can make it beneficial for human health (Albertini *et al.*, 2007; Quattrini *et al.*, 2016). The level of mineralization must persist stably within the range of natural fluctuations.

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In this paper, we reviewed the catchment management experiences of the Evian NMW bottling company. Evian is one of the leading bottled NMW brands in France, with global exports and becoming a role model for bottling companies in many countries because of its long-term experience in sustainably managing the NMW source area's quality and quantity. The company has been operating for more than 200 years, and the company's diversified expertise in source protection has gradually grown to its current level. The 130,000 m³ bottling plant is modernized and serves as a benchmark for bottling companies in many other areas and countries. Its water source is the French Alps, in the vicinity of the city of *Evian-Les-Bains*. The aquifer recharge is from precipitation and snowmelt. The country's regulation for the NMW is strict and demands stable composition, purity, temperature, and other vital features of the NMW. Accordingly, the NMW from Evian is well-defined by its groundwater source, purity, and its mineral content stability. Evian does not use any chemical treatments, additives, disinfectants, or preservatives. If the mineral concentration of the NMW changes, the appropriate label of NMW would be lost (Defrance, 2015; Lachassagne *et al.*, 2011). The Evian Company has worked cooperatively with the local community for over 25 years to preserve the NMW resource and promote its ambition of a sustainable business operation.

2. Protecting Catchment Areas and Its Environment

2.1 Overview

The experiences of bottled water companies in France show that they are continuously moving forward with proactive and advanced ideas to meet environmental challenges related to bottling materials and watershed management sustainably. For business sustainability, these companies are working hard to improve their environmental performance through effective and planned resource management (Beley *et al.*, 2016; Maxwell, 2017).

Evian began modern hydrogeological investigations at the beginning of the 1960s. Starting from the late 1980s, the Evian Company initiated the promising multi-sectorial water safety

policy undertaking town and country planning, wastewater treatment, tourism, agriculture, and biodiversity and wetland protection. Still today, these strategies are considered to be key and are follows. The strategy depends on the APIEME (Association for the Protection of the Evian NMW Catchment Area), an association which includes the residents of the villages (or municipalities) located around the spring area and in the catchment area (Ellen MacArthur Foundation, 2017). The strategy is to sustain the Evian NMW by encouraging maintainable local economic development. The main values of this participative protection policy are mutually favoring the NMW resource protection with the development of local community. To guarantee the protection of the NMW source from pollution and to ensure both its quantity and quality, comprehensive groundwater administration is crucial (Fitch *et al.*, 2016). Evian has been involved for long periods in water preservation. Starting from 1926, the company defined a groundwater source zone and a protection zone around the catchment in France to prevent impacts from human activity in the area. Conserving the watershed area, which is composed of forests, pastures, and wetlands, over the Gavot Upland in the French Alps is the main precedence for Evian. The catchment area, or the impluvium, is where rain and snow infiltrate into the ground and filter while passing through the aquifer, and then collect and are transported to the source, after moving for more than 15 years underground. The water obtains its unique mineral arrangement until it reaches the outflows site. In 1992, the company formally created the APIEME to inspire collaboration among local growers, societies, authorities, and the Evian Company to promote sustainable development in a 35 km² area and focusing on wetland area protection (Beley *et al.*, 2016).

The unique natural mineral properties of Evian water are mainly because of its water source which originates from rain and snow accumulation in the catchment area. On one hand, the class and cleanliness of the Evian NMW rely on the hydrogeological system functioning of the Evian aquifer. On the other hand, the constructive initiatives and collaborations by the Evian teams and resident groups play a key role. This protection ensures the availability of sustainable NMW with constant purity, taste, and unchanged mineral composition.

The company has been working with the local community

in a spirit of co-ownership to preserve the water resource and work towards its ambition of sustainable industrial development and its dream of sustainable industrial functioning. The company and local people partnership endeavors to balance protection of the NMW resource and sustainable agricultural development within the catchment area (Lachassagne *et al.*, 2011).

The Evian bottling site is committed to sustainability initiatives, such as:

- The main food manufacturing site in France, is to attain the carbon-neutral position, independently certified by the Carbon Trust;
- The bottling site is obtaining sufficient power from renewable energy sources;
- In the years from 2008 to 2016, the total energy consumption by the Evian industries per liter of production reduced by 23% while increasing the total production volume of bottles to meet increasing customer demand;
- The company's waste management practice performance for recovery, recycling, and conversion to energy reaches 100%, 92%, and 8%, of waste material being avoided, respectively, and;
- Evian has been certified for its bottling site environmental protection and for its optimal systems of energy and environmental management practice, i.e., ISO 50001 and ISO 14001.

2.2 Geographical characterization of the site

The Evian spring zone, where the water outflows from the mineral aquifer covers an area of approximately 16 km² (1,600 ha). The site is located at an altitude of approximately 400 m. Villages are located in and around the spring area. The Evian catchment zone called the “*impluvium area*” covers a surface area of approximately 35 km² (3,500 ha). Some settlements are located in the catchment area, which located at a higher elevation range of 800 to 1200 m.

2.3 Geological characterization

Due to the particular geological configuration, the water of Evian is well protected in a confined (artesian) aquifer, notably in the spring area. In the watershed area, rain and

snowmelt water infiltrates on the 35 km² impluvium area and flows to the spring through: (1) a multilayer system with relatively low hydraulic conductivity giving the water of Evian its particular mineral composition due to the water-rock interactions, and; (2) in the last part of the NMW transit, through high permeability sands forming the confined aquifer (Blavoux *et al.*, 2013; Lachassagne *et al.*, 2014).

2.4 Principles of Protection Policies

To protect the NMW, the Evian Company designed a protecting policy of water that covers wetland protection, wastewater treatment, agriculture, biodiversity, tourism, and planning of town and country. Considering all the multi-sectorial participation and engaging it with the regulatory framework, the analyses focus on voluntary agreements, for instance between the farmers and the APIEME. The policy is referred to as the “payment for ecosystem services (PES)”, also known as the economic policy instrument (EPI). It is focused on advancing environmentally-friendly agriculture centering on dairy production related to cheese manufacturing. Fundamentally, the APIEME assists financing projects which is to protect the quality of Evian NMW (Beley *et al.*, 2016; Defrance, 2015).

The area was classified into two categories referred to as the spring zone (i.e., the area near the spring), and the impluvium (i.e., the upper recharge zone of the aquifer). The principles of protection for spring site (spring zone) are:

- Natural geological protection, ensured by an impervious clayey layer until approximately 50 m thick.
- Technical protection methodology including design and protection of the spring water transferring system.
- Regulatory measures such as DPI (Declaration of Public Interest) that are considered for the reliability of the aquifer, by submitting to a permit for any action (such as drilling, digging for building foundations, etc.) that may reduce the till protective cover.

As preventive protection policies had been implemented since the early 1990s, the principles for protection of infiltration/recharge zone have become less pressures for the NMW. Due to a specific geological formation, in the recharge area, due

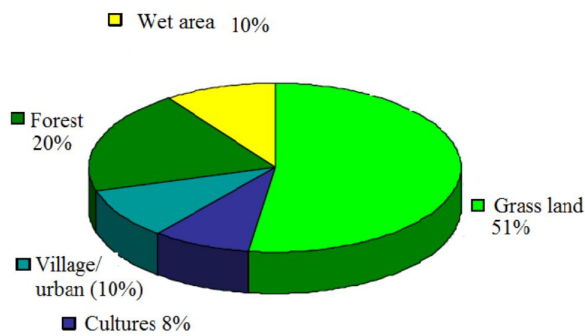


Fig. 1. Land use of Evian natural mineral water (NMW) site (Lachassagne *et al.*, 2011)

to the deep soils and medium to low permeability rocks that overly the aquifer, the spring water is well preserved. The land use of Evian NMW site is shown in Fig. 1.

In addition to the geological natural protection, water from Evian, as a NMW, is defined by its groundwater origin, purity and the stability of its mineral content, and absence of any chemical treatment.

Accordingly, there is no qualitative issue for the Evian resource because of all the stakeholders (Evian and communes of the spring site and the recharge site) work jointly for the sustainability of the NMW.

3. Economic Characterization

The population in the area is approximately 17,000 people of which 75% are located in the spring area with a population density of approximately 600 people per km², whereas it is approximately 100 people per km² in the impluvium area. The main professional activity in the impluvium area is agriculture, characterized by dairy cow breeding for typical local PDO (Protected Designation of Origin) cheese production. When facing a situation of pressure or pollution, NMW bottlers have five alternative options (Lago *et al.*, 2015):

- relying only on natural protection doing nothing;
- based on legal or regulatory actions, making polluters to modify their practices;
- relocating their activity by choosing new and non-contaminated resources;
- buying all lands in the vicinity of their impluvium, and;

- achieving a contractual arrangement or a voluntary agreement with polluters.

Even though no specific study has been conducted to define a least cost analysis to support decision-makers, Evian managers identified the need to reconcile the development of villages from the source and impluvium areas by voluntarily integrating them into the decision-making process to design win-win methods of upstream-downstream financial redistribution. When they acted, in the early 1990s, the Evian NMW was not facing any existing pressure or pollution, as traditional agriculture had existed in the area for centuries without any impact on the NMW quality. However, the managers feared that an evolution of agricultural practices (e.g., with an increased number of cows) may impact the NMW quality. Then, they established with the farmers the PDO label to recognize the high quality of the cheese and enable its sale at an improved price. It helped maintain this kind of agriculture with joint benefits for farmers who increased their income, and for Evian which maintained the quality of the NMW. Then, the APIEME assisted farmers with subsidies to adapt their farms to modern hygienic standards, in particular, to transform milk into PDO cheese.

3.1 Costs of the EPI design and implementation

The yearly budget of the APIEME is approximately EUR 700 000 which is two-thirds funded by Evian and one-third funded by municipalities with a spring in their area, and thus benefiting from the tax on NMW. For agricultural activities, nearly 13% of this is allocated, i.e., approximately EUR 85 000 per year, and, considering the agricultural surface area, this equates to EUR 35 per hectare. However, it is important to consider that no allocation of money is given per hectare; rather, money is only provided through common projects such as subsidies to improve hygienic milk transformation, or, recently, the building-up of a biogas facility. The sharing of the budget actions between sectors (urban, agriculture, etc.) and activities within the agricultural sector is decided annually by the APIEME according to needs. Although the delivery of this money did not reflect accurately the planning, it was reflected in the long term.

The budget prediction defined in the agreement signed by

the parties. The first priority is to fulfill with standards of livestock buildings and to comply with standards of dairy farms. Next priority is to renew and establish cooperative dairies for cheese production.

3.2 Sustainability of the project under land-use and climate changes

Groundwater quantity and quality can be affected directly or indirectly by land use and climate changes. Recharge rate change and water quality problems are priorities in groundwater management. Like any catchment groundwater management practices, catchments subjected to the bottled groundwater industry should link the effects of land use and climate change for sustainable catchment development. However, in the bottled groundwater industry, such reports are limited or are not published.

Evian NMW follows the preventive policy. The main economic activity in the catchment is agriculture. Land-use change is managed by the participation of local farmers, who finance traditional agricultural projects to ensure the sustainability of development in the catchment area. For instance, maintaining agriculture instead of transforming land into housing will maintain soil permeability, and avoid reductions in recharge.

Moreover, groundwater resources need to be assessed in the context of atmospheric carbon dioxide enrichment, climate warming trends, and related changes in intensities and seasonal variation of wet and dry periods (Fitch *et al.*, 2016). The European bottled water industries aspire to reduce the carbon dioxide release resulting from bottling industries by optimizing energy use (Beley *et al.*, 2016; Defrance, 2011, 2015). However, there is no clear study related to the connection between catchment for bottled groundwater and climate change and countermeasures proposed or implemented.

In general, the sustainability of bottled groundwater projects under climate and land-use changes needs to be planned in conjunction with environmental health. Protection of the ecosystem and continuous supply of the resource demand an integrated management system.

4. Concluding remark

In this note, we reviewed the catchment management experiences of the Evian NMW bottling company. To sustainably preserve the bottling NMW sources, it is crucial to specifically learn about the source site (geology, recharge zone characteristics, population density and settlement, other activities such as farming, etc.), regulations, and management of bottled water. Based on the experiences from Evian, linking all stakeholders in the site, including the bottling company and based on a win-win strategy (i.e., financially benefiting all the stakeholders), while keeping any contaminants from sources can be lessons for NMW bottling companies worldwide. Several socio-economic studies were to be performed in order to protect the spring's quantity and quality: agriculture, land use/land cover, study of wetlands and their biodiversity, etc.

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