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9B19A031

arcenciel: bottle Caps for wheelchairs

Dr. Bettina Bastian, Kim Issa, and Sasha Larnaud Mourgues wrote this case solely to provide material for class discussion. The authors do not intend to illustrate either effective or ineffective handling of a managerial situation. The authors may have disguised certain names and other identifying information to protect confidentiality.

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On a sunny afternoon in 2015, Pierre Issa, the director of Arcenciel (AeC) one of the leading non-governmental organizations (NGOs) in Lebanon, was strolling down a street in Gemmayze, a charming bohemian neighbourhood in buzzing Beirut. As he passed a grocery store, he saw bags of empty water bottles in the entrance, set aside to be collected for recycling. He felt a surge of pride as he realized that AeC’s bottle caps project had created grassroots awareness of the importance of recycling.

In recent years, AeC had grown from an organization that supported people with disabilities and those who were considered to be disenfranchised to become the largest recycler in the region. The organization had managed to create a synergy between its engagement on behalf of people who had been marginalized, and its activities to dispose of garbage in a sustainable and environmentally friendly way. One marketing project in particular leveraged the idea of garbage recycling in Lebanon and created the foundations of AeC’s reputation as a leader and expert in the field. The organization encouraged the Lebanese public to collect plastic waste and offered to donate wheelchairs to people in need and those with disabilities in exchange for each tonne of collected bottle caps. This initiative managed to engage thousands of people in joint collection efforts.

As Issa looked at the bags of empty bottles, he wondered how the trust that AeC had gained through the bottle caps project could be harnessed to bring about political change, and to place environmental and social issues in Lebanon on the national agenda.

Background of Arcenciel

Services and Manufacturing of Medical Equipment for People with Disabilities

The civil war that ravaged Lebanon between 1975 and 1990 left behind many people who had physical disabilities, as a result of having been injured from the fighting, bombs, and anti-personnel mines. During that time, and in parallel with the increase in demand for medical services, the public sector collapsed, which led to a complete deterioration of the Lebanese health care system.[[1]](#footnote-2) Hospitals were overwhelmed by the influx of the casualties of war, and medical supplies became scarce. Lebanese people were forced to resort to the much more expensive private sector for the provision of much-needed health care, which turned medical care into a privilege, available only to those who could afford it. Other organizations, such as NGOs or international agencies, were either not present in the sector or simply unable to deal with the needs of the growing number of people with physical disabilities. Individuals with disabilities in Lebanon became marginalized, and their human dignity was eroded. Without proper health care, they remained crippled—physically and socially—and unable to re-establish their life or participate in the workforce again.

In 1985, Issa and a group of friends decided to take action and founded AeC. At the time, Issa was the owner of Lignes et Couleurs (Lines and Colours), a furniture factory that employed people with disabilities. The other AeC founders included Antoine Assaf, who had experience in working with people with disabilities; Nabil Hokayem, a medical doctor; Nassib Chedid, a lawyer; and Johnny Stéphan. The NGO’s name, Arcenciel, was a variation on the French word for rainbow, which was intended to symbolize a commitment to serve everyone, without discrimination. Over time, the rainbow’s colours evolved to represent inclusion and respect for all people. For the founders of AeC, the symbol also represented hope for new beginnings, with the organization being established in response to a civil war that had segregated the society into sectarian and political factions. During that period, all social work and developmental endeavours had been carried out by political parties that exclusively served their “own” people or religious sect. In response, and in an effort to integrate sustainable development into society, AeC defined its mission as working with and for all people living with difficulties, irrespective of their age, gender, religion, culture, race, or nationality. With that mission, AeC addressed the needs of individuals who were in difficulty, while avoiding any sectarian affiliation.[[2]](#footnote-3)

The founders of AeC wanted both to create awareness of the needs of people who had disabilities and to alleviate their hardships. They provided practical information for concerned people, including where to find wheelchairs, how to better accommodate the daily life of a person who had handicaps, and how to furnish and arrange the house so it was better adapted for the needs of a person who was disabled. They also created a safe haven, where people with similar issues could exchange their stories and learn from each other. The NGO allowed people with disabilities to break out from their social isolation and to feel stronger as they engaged with people of similar circumstances and learned how to defend their own interests.

The early stages of the NGO were time-consuming and stressful for the founders. They spent many hours, all over Lebanon, going door to door and meeting with the families of individuals who had disabilities, creating awareness, informing the public, and learning more about specific needs of people living with disabilities. One important need that AeC was able to identify was the shortage of wheelchairs available in the Lebanese market. The organization responded first by fixing broken wheelchairs, then by manufacturing them locally.

In 1987, AeC launched its first wheelchair factory in Jisr el Wati and hired people with disabilities to operate it. Doing so reflected the NGO’s core mission at the time—to work with and for all people who lived with difficulties. Later, AeC opened production facilities in the Beqaa Valley and Akkar, outsourcing the manufacturing of mechanical parts that required more technical expertise. The organization went on to establish centres in Halba, Taanayel, Damour, and Jisr el Wati, specializing in the production or assembly (or both) of wheelchairs, orthopaedic shoes, walkers, and other medical equipment. For example, in the Beqaa Valley, AeC produced wheelchairs made by employees who used wheelchairs themselves, and in Akkar, the organization produced crutches and equipment made of aluminum. The facilities were located in rural and remote regions, with the idea of creating jobs and professional prospects for people with handicaps and those who had meagre professional qualifications. The production facility in Beirut was dedicated to the manufacturing of precision instruments and electrical products, as well as beds, elevators, and systems for adjusting cars to replace foot pedals with hand-operated pedals.

The strategy of AeC was to respond to the considerable unfulfilled needs of people who had physical disabilities and lacked access to medical support. According to Issa, the organization’s strategy always remained focused and loyal to its vision—to serve all Lebanese people in need. The organization began offering physiotherapy treatment in all its centres and went on to offer services in remote areas, where help was needed. For example, knowing that the Akkar Governerate had virtually no specialized services for people with disabilities, AeC opened a specialized health facility in its capital, Halba. The AeC rehabilitation centre offered physiotherapy, hydrotherapy, and neurological and orthopaedic services.[[3]](#footnote-4)

In 1995, AeC started an initiative called Accès et Droits (Access and Rights), which aimed to support people with disabilities in Lebanon and to make their needs public by lobbying for laws that protected their interests. What had started as a grassroots approach ended successfully in 2000, when the legislator adopted Law 220 that granted people with disabilities the right to treatment and support. This law also gave people with disabilities the right to own a wheelchair, regardless of their financial situation. The law was the result of AeC’s many years of fieldwork and of learning to become experts at what they did. AeC used this particular experience to bring the needs of people with disabilities to the attention of the national Lebanese agenda and to instigate change at the national level. It was a great success and increased AeC’s credibility and visibility. Issa and his friends had succeeded in making the rights of people with disabilities a public matter.

Hospital Waste

In addition to working to help people with disabilities, AeC decided to tackle the pressing issue of environmental pollution due to Lebanon’s insufficient and failed waste management strategies. In the small and densely populated country, most people lived in cities, and Lebanon’s population doubled between 1960 and 2005.[[4]](#footnote-5) The amount of garbage increased in tandem with the population. Urban expansion reduced the landfill space available to stow refuse, while the demographic boom increased the quantity of garbage generated. In 2013, Lebanon produced 2,040,000 tonnes of municipal solid garbage,[[5]](#footnote-6) of which 8 per cent was recycled, 15 per cent was composted, 51 per cent went to landfills, and 26 per cent was disposed of in open dumps, according to the country report on solid waste management in Lebanon.[[6]](#footnote-7)

In 2003, after deciding to enter a niche sector of waste treatment, AeC created a hospital waste management program called DéHo. The program’s objective was to reduce the risk posed by the mismanagement of hospital waste by collecting and treating hospital waste by sterilizing needles, bandages, and other items generated by hospitals. The program focused on waste management, education for sustainable development, training, and consultation.[[7]](#footnote-8) By 2011, AeC had become Lebanon’s market leader in that sector, and was treating 90 per cent of the high-risk (i.e., infectious) waste produced by hospitals. Before AeC entered the sector, Lebanon had no waste treatment system. Hospital waste had been inadequately treated, posing a danger for public health and for the environment. Moreover, hospitals lacked the financial resources to implement individual treatment systems that complied with international health standards.[[8]](#footnote-9)

Solid Waste in Lebanon

After the end of the civil war, Lebanon had no waste management strategy for dealing with municipal waste. The government had allocated only a limited budget for waste management, and it was reserved for Lebanon’s only waste management company, Sukleen,[[9]](#footnote-10) which used several landfills, including one located in the Naameh region.[[10]](#footnote-11) With the entire waste management process in the hands of one enterprise, the task soon proved overwhelming for the understaffed organization.[[11]](#footnote-12) Some recycling efforts were initiated, and some people started sorting their waste at home, but the waste had to be deposited in bins owned by Sukleen, which enjoyed a monopoly in waste management and was the only source for recycling bins. However, as Issa noted, Sukleen kept transport costs low by compacting the sorted waste together with the unsorted waste and dumping everything in the landfill. Moreover, the political divisions in the country from 18 different religious sects blocked any possible changes for improvement. In such an environment, decisions on political projects such as waste management needed to consider the economic interests of individual sects and members of political parties. Waste management was a big business in Lebanon, and was the source of many internal conflicts that slowed and devastated any initiative or attempt at finding a durable political solution.

Recycling for Solidarity

The objectives of AeC were tailored to upholding the concept of sustainable development, which meant that they were based on social, environmental, and economic principles. Socially, AeC instilled diversity in its programs and activities and included people who had been marginalized. Environmentally, the organization promoted recycling and the preservation of natural resources. In terms of the economy, AeC helped ensure maximum financial and economic autonomy. The overall approach of AeC was to create change in the country, as Issa explained:

There is always a growing need that calls for a project or a certain initiative, and the process is encompassed within three pillars: First, you come up with a pilot project to address this growing need; second, you become a centre of reference; and third, you pass the law.

In response to the country’s poor waste management schemes, AeC developed its own waste management strategy. The plan aimed to offer a cost-effective approach to waste disposal based on sorting, recycling, and funding of social services through the sale of sorted waste. Issa described the strategic approach as opportunistic. Seeing a waste management crisis rising, AeC’s decision makers decided to seize the opportunity to leverage its experience in the hospital waste sector, using the credibility and knowledge the organization had amassed in treating toxic waste.

The initial goal was to create incentives for citizens to sort waste and, through this process, to help them become aware of the usefulness of recycling. Moreover, AeC planned to learn about waste typology and categorization, which would later help the organization develop a viable business model that involved different types of recyclables that could be exploited and sold on the local market. In the long term, AeC hoped to find a viable solution for the waste problem in Lebanon, based on decentralized waste treatment at the municipal level. The organization also wanted to prove that the Lebanese people could embrace sorting at the source, if the providers offered proper waste collection and treatment. With this view, AeC was contradicting prevailing arguments that the Lebanese population was not sufficiently mature for a decentralized approach, and that waste sorting in the household was not feasible in that country.

In 2009, AeC launched the Recycling for Solidarity project. A year before the official launch, AeC had already started to develop local initiatives to show the population the economic opportunity that recycling offered. The organization also wanted to prove that recycling could help municipalities save valuable landfill space, and that waste could be turned into value and used as a resource in different contexts. Over the long term, AeC aimed to expand its activities to include sorting and recycling of different types of waste, and to promote best practices for waste management across the country. In this context, AeC planned to develop smaller waste management initiatives that would become models of best practice, and then turn them into reference projects for potential future public action.

The Difficult Task of Raising Awareness

To begin its ambitious program, AeC tackled one of the greatest challenges: raising awareness about the important role that recycling could play in solving the Lebanese waste problem. According to Issa, Lebanon’s postwar generation was not thinking about the future—and especially not about the environment. The people were more concerned about living day to day. Environmental protection was not a major concern in their daily struggle for economic survival.

Essa was impressed by a French program called L’École Agit (roughly translated as “school action” or “school acts”), which the French Ministry of Education successfully introduced in 2007 to educate young school children about sustainable development. The idea was to reproduce this concept in Lebanon and to create awareness among Lebanese children about how their daily activities could create a lot of solid waste, with possibly irreversible consequences on the environment. In this campaign, AeC did not focus specifically on garbage, but instead advocated sustainable development in general.

In 2008, the first *Eco-Attitude* booklets were distributed in schools across Lebanon. One year later, the booklets began being printed on recycled paper to be consistent with AeC’s message on recycling and sustainability. The booklets included tips and tricks to adopt an eco-friendly way of life. The AeC team also proposed workshops about recycling for children. The aim was to have interesting enough activities that would convince children—and through them, their parents—to recycle.

With strong support from sponsors, AeC introduced its own version of the French program L’École Agit. The program’s sponsors, who were known for their experience, promotion, and conservation of nature, included Maxime Chaaya from Lebanon and Nicolas Hulot from France. Hulot was a well-known environmental activist and a major influence among young people in France. Both men loved the idea of introducing recycling to Lebanon and wanted to reapply the French programs that had proven to be success stories.

Right from the beginning, AeC’s initiative enjoyed the support of Lebanon’s Ministry of Environment. Working together, AeC and the ministry reached 335 schools throughout Lebanon and worked on nurturing ecological behaviour among the students. In 2010, the project became more institutionalized. The name was changed to Happiness Heroes, referring to the children who were recycling. Picon, a Lebanese subsidiary of the French group Fromagerie Bel, was the external sponsor that assured the financial durability of all three phases of the project. Picon was less interested in the long-term strategic vision of the project, regarding national waste management. The company agreed that the workshops and contests in schools were interesting from a marketing and corporate social responsibility perspective. However, Picon believed that the program had little effect in convincing future generations about the need for a cleaner and greener planet.

The marketing manager of AeC felt that copying the approach of L’École Agit and launching the Happiness Heroes were bad marketing choices that could kill a good idea. According to him, a good campaign had to answer three questions: Who is our audience? What is the message? Why are we sending this message?

However, only the last two of the three questions had been addressed. The Lebanese population needed to start sorting and recycling to reduce the amount of waste in Lebanon. Picon was very happy with the outcome of the project, but AeC felt that the Happiness Heroes initiative had failed to understand the mindset and mentality of the Lebanese people, which differed from that of the French. For example, Lebanese kids proved to be disinterested in sorting garbage. After only a few days, they lost interest in recycling altogether.

Although AeC decided not to drop the project, there was a great deal to be learned from it. Issa noted that AeC had learned to focus more on the big picture. He observed that children liked the playful aspect of the program while in the school, but soon forgot to apply the concepts about recycling outside class. Issa thought that AeC was too focused on the small projects, which was also the donor’s opinion, rather than ensuring that the kids continue to recycle. In the end, the project seemed to amount to interesting ideas without long-term vision for a clean environment.

Rolling Caps

In 2009, Issa received a phone call from his friend. Her son’s teacher in Beirut had asked her students to collect the caps from plastic bottles. The teacher would then send them to Switzerland to be sold and recycled in exchange for a free wheelchair. Issa’s friend wondered, “Why not sell and recycle the caps in Lebanon instead of Switzerland? It would be the chance for children to concretely see the result of their recycling efforts.” Being familiar with AeC’s past activities, including the production of wheelchairs and the promotion of recycling, Issa’s friend wondered whether the social equation “plastic = wheelchair” could apply in Lebanon. Issa was skeptical about the idea at first, thinking back a few years earlier to the unethical business practices of some cigarette merchants who had spread false information about the aluminum wrapping of cigarette packaging being recycled to make wheelchairs, which had turned out to be a hoax intended to encourage cigarette sales. Still, Issa decided that the idea was worth at least a trial, and thus the Rolling Caps project was launched.

To finance the building of a wheelchair, AeC needed 500,000 bottle caps, which would raise the $300[[12]](#footnote-13) needed to build one wheelchair. The important factor in this plan was that, in the end, the children would be able to see clearly the results of their work. On average, it took about a year for a school to collect sufficient bottle caps to “donate” a wheelchair.

The Rolling Caps became an instant success. The first school to enter the program was the Collège Louise Wegmann, a private school in east Beirut. The concept of collecting bottle caps to donate a wheelchair to the needy aroused the students’ interest and created real excitement. They felt they could be of concrete help to others. By the end of 2009, the pupils of Collège Louise Wegmann had collected the required number of bottle caps to exchange for a wheelchair. The experience taught Issa that connecting with the Lebanese people differed from connecting with Europeans. The long-term horizon of a cleaner planet didn’t make sense to people emerging from war and living in an uncertain geopolitical context. However, the idea that their actions would actually benefit a person with disabilities who was living in Lebanon seemed to fill them with enthusiasm.

A Mountain of Caps under Our Desks!

The bottle caps project was started spontaneously, without a specific team or financial endowment. However, AeC was able to leverage a large and efficient network of efforts, stemming from its activities in the hospital waste treatment and its long-standing support of people who were marginalized.[[13]](#footnote-14) Schools and institutions served as collection centres for the plastic caps provided by students and employees.

A leading global logistics and transportation provider called Aramex learned about the Rolling Caps project and proposed a partnership. Aramex was founded by a Lebanese entrepreneur and based in Dubai. The company offered to use its delivery vans to help collect the bottle caps from people’s houses, which meant that individuals had become involved in the project, in addition to schools and institutions. When people had bags filled with caps ready to be picked up, they contacted AeC, which informed Aramex and provided the pickup address. Two AeC volunteers were responsible for coordinating efforts with Aramex, which collected the recycling items and delivered them to AeC without cost. In 2009, only one Aramex truck was dedicated to the initiative, and AeC had no budget allocated for the project. However, despite the meagre resources deployed, the bottle cap program was successful from the start and grew very quickly.

AeC would collect the bottle caps and transport them to secondary sorting centres, where they were compressed, then sold and shipped to a recycling company. The value added within each step of the process was within AeC’s mode of operation. People who were marginalized and had difficulties that prevented them from being integrated in the regular labour market were integrated in the collection, sorting, and shipping activities, which fulfilled AeC’s social commitment. Sorting the waste at the source (i.e., in households) assured environmental sustainability by avoiding the sporadic dumping of waste material on land and in the sea. Moreover, supplying local companies with raw materials obtained from recycled plastic caps empowered AeC and created more job opportunities at the local level. Altogether, the project promoted the use of local recycling plants, the involvement of workers into the market, the financing of wheelchairs, and a decrease in imported raw materials.

In the early stages of the project, AeC stocked the bottle caps in its Jisr el Wati centre, which could hold 500 kilograms of caps. The organization sold the bottle caps to a plastic recycling plant called Narizcoplast. Eventually, in 2015, AeC established seven other collection centres, where people could deliver the bottle caps on their own. Before long, the volunteers became overwhelmed by the results. “We had mountains of caps under our desks!” exclaimed Olivia Maamari, who worked in the AeC environment program in Jisr el Wati. During the first year, approximately 5 tonnes of bottle caps were collected, which increased fivefold the next year. In 2010, approximately 27 tonnes of caps were collected. Assuring the success of the initiative, awareness was spreading by word-of-mouth through the message, “Your waste has value, and with it you can help someone in need!”

After collecting 500,000 bottle caps, which weighed approximately 1 tonne, an individual in the institution, company, or school that reached the required number of bottle caps would contact AeC to receive the promised wheelchair. In most cases, people would start the collection for a person who was disabled whom they personally knew at school, work, or in the neighbourhood. To encourage the collection, AeC created the Certificat des Amis des Bouchons Roulants (or “certificate of the rolling caps friends”), which was offered to kids participating in the project. The success story of recycling caps made its way into children’s minds, and encouraged them to be a part of it. Rana Asmar, who was in charge of AeC’s treasury department, told her nephew the story of this initiative and he started collecting caps. For his birthday, he asked to visit the centre at Jisr el Wati, where they made the wheelchairs. He wanted to see the result of his hard work and to obtain a copy of the “certificate of the rolling caps friends.”

The entire promotion campaign took place through social networks and word-of-mouth. Several schools and organizations, such as the Scouts du Liban, joined the project and offered to collect bottle caps in their scout camps. Companies such as Société Générale de la Banque du Liban also took part in the project, which guaranteed the collection of a huge volume of caps and increased media visibility. Some establishments installed their own collection boxes at their workplace for the collection. Institutions that joined the effort included banks, companies, schools, and at least three universities: the International College, the University Saint-Esprit de Kaslik, and University Saint-Joseph. The global bank HSBC designed its own boxes for the collection. In 2009, 12 institutions and companies participated in the recycling effort. That number increased nearly fourfold in 2010, when 45 organizations joined the campaign. In 2016, 450 organizations across Lebanon participated. The amount of bottle caps collected increased from 2.2 tonnes in 2009 to 28 tonnes in 2010 to 1,413 tonnes in 2016 (see Exhibit 2).

Rolling Caps’ impact grew bigger and spread outside Lebanon. As AeC worker Maamari explained, “Lebanese people living in Dubai started to call and email the environment program to know if they could send caps by plane.” Obviously, the idea of plane travel was not very eco-friendly, but AeC had achieved its objective to incentivize the Lebanese people to sort and recycle, and the message spread like wildfire. However, some people were unclear about the process. For example, one teacher asked Maamari one day, “Which part of the wheelchair is made with the caps?” People understandably associated the bottle caps the actual construction of the wheelchairs, instead of with the money that AeC received from selling the bottle caps to recycling companies.

In reality the recycling process comprised several steps. First, people would deposit their recyclable waste in any one of AeC’s seven collection centres. People could also choose to call the AeC centre and have Aramex collect the bottle caps within two or three days. Second, the caps were sent to the closest secondary sorting plant to be resorted correctly, compacted, and sold to a recycling company. In 2015, AeC had two sorting centres. Third, the compacted plastic was transported and sold to end-treatment centres, where they were crushed and then melted back into plastic. Most of AeC’s work was with the recycling factory Narizcoplast, which transformed the caps into construction and irrigation pipes. Other recycling factories used the plastic from the collected bottle caps to produce various other products such as benches and flowerpots. By 2015, more than 50 jobs had been created in the bottle cap recycling sector (e.g., administrative positions, labour workers, drivers, helpers). The project had a very simple cost structure. With external partners organizing the collection and transportation of the bottle caps, AeC did not need any factories or machines to treat the plastic. Its costs were nearly entirely related to salaries (see Exhibit 3), unlike the cost structure of an integrated recycling company.

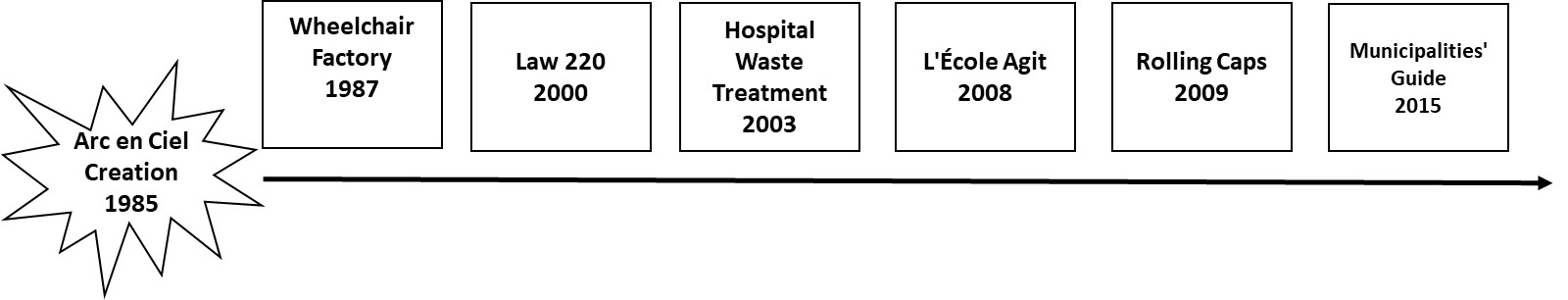
Eventually, AeC broadened the scope of its activities to encompass other solid household waste such as paper, aluminum, and iron. In 2013, AeC was collecting the full plastic bottles, rather than just the caps. It was able to harness the power of the bottle cap initiative for additional purposes. People became motivated to recycle and were excited to add other materials to their sorting bins. The wheelchair initiative was the first push they needed to gain a recycling mindset. From that point on, adding types of recyclables to the bins seemed to come more easily. Since the start of the program in 2009, more than 140 wheelchairs were provided by AeC in return for 140 tonnes of recycled plastic caps.

In 2013, AeC had an annual operation budget of $14.2 million, of which 28 per cent came from donations and grants. The rest of the revenue was generated by sales of products and services such as recycling and hospital waste treatment.[[14]](#footnote-15) According to Issa, the organization received about $300 per tonne of plastic (from 500,000 bottle caps) that it delivered to companies using their plastic as raw material.[[15]](#footnote-16) The price was dependent on several factors, including the weight of the plastic, the type of plastic, whether it was compacted or not, and whether it was delivered to the recycling plant directly or indirectly. Bottle caps consisted of only 5 per cent of all recyclable items, but the program increased the visibility of AeC in Lebanese societies and gave it the momentum to expand its activities and become the most important recycling promoter in Lebanon. Nevertheless, recycling had not been profitable and generated a profit loss of approximately $300,000 annually. Still, AeC considered it a valid price to pay for its efforts. The bottle caps project had started in schools and gave the organization credibility in Lebanon’s recycling industry.

Later on, in 2015, when Lebanon was overwhelmed by a waste management crisis, AeC was the first organization to be approached by both private and public institutions, such as municipalities, for help with advising and developing viable decentralized solutions for recycling activities in Lebanon. Invitations to government meetings about waste management approaches were common, and AeC was able to influence thinking processes on these issues. The organization also helped develop legislation to give recycling the same level of importance as other waste management decisions across the country.

Issa reflected on the most important learning outcomes from the bottle cap project. How could AeC’s status and reputation in the field of recycling be used to raise the issue of waste management onto the national agenda. How could the organization compensate for the failures of a weak state? And how could AeC expand its activities and strengthen its engagement in the future?

EXHIBIT 1: Arcenciel’s MAJOR MILESTONES, 1985–2015



Source: Company documents.

EXHIBIT 2: Tonnes of Bottle Caps-waste COLLECTED BY Arcenciel, 2009–2016 (in TONNES)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Year** | **2009** | **2010** | **2011** | **2012** | **2013** | **2014** | **2015** | **2016** |
| Number of participating  organizations | 12 | 45 | 70 | 130 | 200 | 280 | 400 | 450 |
| Tonnes of waste collected | 2.2 | 28.0 | 47.0 | 138.5 | 161.0 | 319.0 | 930.0 | 1,413.0 |

Source: Company documents.

Exhibit 3: Cost structure of arcenciel’s integrated recycling activities in 2015

|  |  |
| --- | --- |
| Salaries | 58% |
| Rent | 4% |
| Depreciation of Recycling Equipment | 28% |
| Fuel and Transport | 4% |
| Maintenance of Cars and Spaces | 3% |
| Others | 3% |

Source: Company documents.

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