

**Title:** ON THE GREENING OF A COLOMBIAN UNIVERSITY AND ITS COMMITMENT TO EDUCATION FOR SUSTAINABLE DEVELOPMENT

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# ON THE GREENING OF A COLOMBIAN UNIVERSITY AND ITS COMMITMENT TO EDUCATION FOR SUSTAINABLE DEVELOPMENT

## ABSTRACT

Politecnico Grancolombiano is a Colombian institution of higher education with over 30 years of existence and more than 16,000 students. The article presents Politecnico Grancolombiano's experience in its path toward becoming a sustainable university. It details the Campus restoration for recovering its surrounding ecosystem, migrating from a deteriorated eucalyptus monoculture to the planting of 60 native species from more than 40 botanical families, thus enhancing biodiversity and landscape beautification. It also describes the adoption of an environmental management system, according to ISO 14001, set in four main programs.

To date the results are promising. The campus recovery process prognoses a successful example of restoration of the eastern hills of Bogota. Progresses in water and energy savings are equally remarkable, as are improvements in waste management, particularly hazardous waste. All university programs have cross-cutting environmental and ethics education. A key component has been the permanent support from the university community, particularly from the Chancellor and other institutional heads.

**Keywords:** Green University; Education; Sustainable Development; Ecosystem Restoration; Environmental Management System; Emerging Country; Latin America

## 1 INTRODUCTION

Politecnico Grancolombiano is a recognized Colombian institution of higher education with over 30 years of existence and more than 16,000 students; which provides technological and professional education opportunities to students in Bogota and throughout Colombia, with both on-campus and online education programs. It has four faculties that offer a total of 11 technological programs, 16 professional programs, and 16 postgraduate degrees in the areas of accounting, audiovisual media, business administration, international business, engineering, marketing and communications, political science, and psychology, among others.

Its campus, of about 10 hectares, is located at the eastern hills of Bogota [i.e. city's strategic ecosystem], which has generated a strong commitment from its directors for the preservation and stewardship of their environment. This, coupled with a pledge to the provision of well-rounded education for younger generations and future professionals, has led the Institution to adopting sustainability as one of its cornerstones.

This article presents Politecnico Grancolombiano's experience in its path toward becoming a sustainable university. It details the Campus restoration for recovering its surrounding ecosystem, migrating from a deteriorated eucalyptus monoculture to the planting of 60 native species from more than 40 botanical families, carefully selected considering the five senses,

thus enhancing biodiversity and landscape beautification. It also describes the adoption of an environmental management system [EMS], according to ISO 14001, set in four main programs: water and energy saving, waste management, environmental management of gardens, and environmental education; the latter grounded on more than ten years of education for sustainability.

To date the results are promising. The campus recovery process prognoses a successful example of restoration of the eastern hills of Bogota, increasing from 1,000m<sup>2</sup> to nearly 9,000m<sup>2</sup> of gardens. Progresses in water and energy savings are equally remarkable, as are improvements in waste management, particularly hazardous waste, with more than 4,300kg of electronic waste properly managed. All university programs have cross-cutting environmental and ethics education. A key component has been the permanent support from the university community, particularly from the Chancellor and other institutional heads.

The remaining of the article is organized as follows. The next section presents a background to the environmental situation in the eastern hills of Bogota and the University's premises. The third section describes the campus restoration process in detail, while the fourth section elaborates on the experience of implementing an EMS; and the fifth section is devoted to education for sustainability. To conclude, the last two sections present, respectively, the results obtained so far and the projections for the near future.

## 2 BACKGROUND

When entering Colombia from its southern border with Ecuador, The Andes - the longest continental mountain range in the world- open up in three parallel ranges, known as the western, central, and eastern ranges. The eastern hills of Bogota are a mountain belt of about 14,000 hectares located to the east of the city, and belonging to the eastern range of The Andes. They correspond to highly steep terrains of heights ranging from 2,600 up to 3,600 meters above sea level (Arias, 2007).

Before colonial times, the eastern hills of Bogota used to be covered by native vegetation, corresponding to various alpine tundra ecosystems known as *paramo*, *subparamo*, high-andean and low-andean forests. With the arrival of industrialization and urbanization as a consequence of population growth and urban development, significant processes of deforestation took place together with the creation of quarries for the extraction of construction materials, such as stone, clay and gravel. In response to these environmental damages, some reforestation actions were performed by introducing foreign species such as eucalyptus, pines and acacias, without giving proper consideration to the imbalances and pressures that such exotic species could cause on the native ecosystems (Alcaldia Mayor de Bogota, 2007:17).

In fact "the high levels of intervention and resource exploitation have meant that the total area covered by native forests represent only 6.03% of the total area of the eastern hills [of Bogota], while the plantations of foreign species such as eucalyptus (*Eucalyptus globulus*), pine (*Pinus radiata*), and yellow acacia (*Acacia decurrens*) constitute nearly 12% of the total area" (DAMA, 2000 cited in Camacho, Muñoz and Quintero, 2004:30).

Historic archives show that the premises where Politecnico Grancolombiano's campus is currently located used to be owned by a wealthy local family of Bogota whom, in the early twentieth century, were operating brick factories and other construction-related operations carrying on intense resource exploitation. The extraction of wood, sand, stone and charcoal for the construction industry continued intensively until the early fifties when, due to the significant degradation and soil erosion, this type of mining was no longer profitable. As a consequence, the terrains were sold beginning a process of constant urbanization. In the early 1980's, the district authorities issued the corresponding permits for the edification of what is nowadays Politecnico Grancolombiano's university campus. Since that time, the premises were already populated by an exotic monoculture of eucalyptus (Camacho, Muñoz and Quintero, 2004:33-35).

### **3 RESTORING THE UNIVERSITY CAMPUS**

This section of the article describes Politecnico Grancolombiano's campus restoration process in detail, which started more than a decade ago, and is currently on its last phase of operation. A significant part of the process took place during 2011, declared by The United Nations General Assembly as the International Year of Forests, in an effort to raise awareness on the key importance of having a sustainable management, conservation and sustainable development of all forests of the world.

Before doing so, it is worth noting that a sound process of ecological forest restoration, implies a multi-disciplinary and integrated approach that is "rooted in conservation biology and ecosystem restoration, [and] includes preserving and protecting intact landscapes...; allowing the land to heal itself; and, where necessary, helping it to do so through active restoration" (DellaSala et al., 2003:15). Active restoration, on its turn, implies the reintroduction of natural processes or species through direct human intervention in such cases when "it is necessary to reintroduce (or secure) natural processes, at-risk species, or regionally extirpated species, and in cases where ecosystem composition, structure, and function are degraded or hindered by factors such as compacted soils, channelized streams, invasive species, or fire suppression" (DellaSala et al., 2003:18). Given the complexities and risks of active restoration, adaptive management principles that include permanent monitoring and evaluation become crucial components of the restoring process.

Thus, the operations put in place since 2010 at Politecnico Grancolombiano University, respond to a process of active forest restoration, with an aim to inducing a sound ecological restoration, through the recovery of a vastly degraded ecosystem. By reforesting in a sustainable way soils that have been seriously damaged due to more than 40 years of a monoculture of exotic species, it is intended to induce a natural ecological restoration, which can be enabled by the new biologic interactions generated on campus, regaining the integrity of the ecosystem by reestablishing its functionality and resilience.

#### **3.1 Preliminary Assessment and Controlled Tree Felling**

Politécnico Grancolombiano started its campus restoration in early 2000, when it received from the environmental authority, DAMA<sup>1</sup>, authorization for the controlled cutting of 50 isolated trees, by means of the Resolution No. 320 of the same year, which was given on the

grounds of the urgent need to adequately handle significant problems identified with the eucalyptus planted in the University. The Resolution states that:

“The elements on inventory represent a potential threat to people, premises and vehicles at Politécnico Grancolombiano, given that those correspond to very mature trees on a precarious physical and/or sanitary state, located on highly cracked slopes, with very strong air currents and intense rain, which intensifies the risk given the height of trees”.

On August 2010, after having previously conducted an on-site inventory within the premises of the university, the Regional Autonomous Corporation of Cundinamarca - CAR<sup>2</sup> issued a technical report identifying 420 trees of the species "*Eucalyptus globulus*" that were in danger of falling due to their phytosanitary conditions, which were exacerbated by eroded sloping floors, and wind patterns and rainfall stronger than the average for Bogotá.

As illustrated on figures No. 1 and No. 2 below, among the main risk conditions identified were (Mejia de Michelsen, 2011:35):

- Significant loss of verticality, leaning towards the university infrastructure, common areas, parking areas, main roads, power lines, etc.
- Weak setting on the substrate and progressive uprooting due to sheet-like erosive dynamics taking place in the surrounding area.
- Partial exposure of roots in several trees.
- Large trees with average heights of 20 and 22 m, which imply a substantial weight of the same, and ease the possibility of falling.
- Signs of gummosis in some parts of the eucalyptus tested, indicating a poor plant health, with possible presence of insects, bacteria and fungi harmful for surrounding vegetation.
- In some cases, presence of dead-standing organic matter.
- Some trees were in actual contact with the infrastructure of the university, creating a high risk and deteriorating it.

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In light of the precautionary principle, the environmental authority deemed appropriate the controlled cutting of trees within the university premises, giving authorization to cut down 420 trees within a time frame of six months, under the resolution 026 of August 4<sup>th</sup> 2010. Further authorizations were given on August and October 2011, for the controlled cutting of 200 and 696 trees, respectively.

### **3.2 Ecological Restoration Plan**

According to Colombian legislation, controlled tree felling as approved for Politecnico Grancolombiano University, must be done together with a compensation measure that helps in the restorative process of the intervened environment. Responding to this requirement, and in congruence with the strong institutional commitment for the preservation and stewardship of the environment, the University's head decided to embark in a restoration plan that would go beyond the normal requirements and would enhance the sustainability of the campus, allowing the institution to operate in entire harmony with its surrounding ecosystem.

In this way, starting on October 2010, the University designed an ecological restoration plan, in three phases (see table No. 1), representing the planting of a total of 1,500 new trees. By the time of writing of this article, the third phase is under execution, projected to be finished by October 2012.

**Table No. 1 Forest use and Restoration Plan**

| Phase | Activity           | No. of trees | % of execution | Finalized by |
|-------|--------------------|--------------|----------------|--------------|
| 1     | Controlled cutting | 420          | 100%           | June 2011    |
|       | Planting           | 500          | 100%           | July 2011    |
| 2     | Controlled cutting | 200          | 100%           | March 2012   |
|       | Planting           | 300          | 100%           | June 2012    |
| 3     | Controlled cutting | 696          | 78.5%          | August 2012  |
|       | Planting           | 700          | 43%            | October 2012 |
| Total | Controlled cutting | 1316         | --             | August 2012  |
|       | Planting           | 1500         | --             | October 2012 |

Source: Own construction

Adding together with the initial 50 trees allowed for controlled cutting in the year 2000, which were replaced by the planting of 300 new species, Politecnico Grancolombiano would have, as of October 2012, replaced a degraded monoculture of 1376 eucalyptus, with the planting of 1,800 trees belonging to 60 different native species.

### *Selection of species*

As stated before, the restoration process wanted to be done in a way that would enhance the sustainability of the campus. Hence, the process was conceived with the idea of fostering the natural ecosystem that used to characterize the eastern hills of Bogota –as exposed on section 2– and which is currently under serious threat.

In order to make a significant restoration of the surrounding ecosystem, it was decided to make a rich and varied selection of species that would vividly represent an environmental recovery, detaching from the prevalence of a eucalyptus monoculture. For that purpose, a group of 84 native species were initially identified, not all of which were adequate for the area, given the special conditions of altitude, precipitation and moistness. Therefore, a judicious process of selection and adaptation was performed. Out of this process, a total of 60 native species from 43 different botanical families were selected, trying to replicate a native Andean cloud forest.

The selection of species was done considering the five senses, in order to offer a vivid combination that could enhance biodiversity and landscape beautification. Thus, species such as the Medlar tree, *Cotoneaster* and *Sangregao*, were chosen based on touch, given the

particularities of their leaves, having thick, smooth and downy leaves, respectively. Considering the sense of smell, species like the Sandalwood, *Buddleja* and *Jazmín del cabo* were selected, profiting from their varied and pleasant scents. In the case of sight, species were chosen because of the dual effect of, on the one side, providing a sparkling combination of shapes and colors that are enjoyable by humans; and on the other, being particularly attractive for birds and insects that yet again contribute to enriching the landscape view as a whole. On these grounds, species such as *Carbonero*, *Chicalá* and *Curapín* were found ideal for serving the purpose. When considering taste, species such as *Feijoa* and Cherry Tree, which produce edible and tasty fruits, were chosen. Lastly, taking into consideration the sense of hearing, species like *Mano de oso*, *Nazareno* and *Garrocho* were picked up given their potential to attract insects, birds and other small animals such as squirrels and other type of rodents, all of which contribute in producing a lively and harmonious landscape (see Figures. No. 3 and No. 4)

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Besides, in order to guarantee the preservation of the plantation and minimize the risks of losses, the elements selected for plantation were expected to be of a minimum height of 1,5mts and a maximum of 2,5mts; and its foliage should be present all along its stalk.

In addition to the 60 native species selected, and given the marvels of nature, in the midst of the most degraded zones of the campus, six varieties of orchids were found living under the eucalyptus that were removed. Hence, the botanical diversity available on campus also includes the following orchid types: *Elleanthus* s.p, *Odontoglossum lindenii*, *Sternorrhynchos* s.p, *Epidendrum secundum*, *Pleurothallis* s.p and *Maxillaria* s.p.

### ***Planting***

As stated above, the native species that were going to be introduced needed to be adapted to the special weather and soil conditions under which they would have to live in campus. Hence, a careful adaptation process was done, bringing the shrubs and bushes from nurseries in the savannah of Bogota, to a process of water stress in the University's nursery.

Similarly, given the significant degradation and acidity of soils due to more than 40 years of eucalyptus monoculture, it was necessary to carry on a soil preparation process before proceeding to the planting of the new native species. The soil preparation was done by firstly disinfecting it with liming in order to increase the pH and improve water penetration; the use of limestone would also ease the uptake of important nutrients, while preventing any type of insects, fungi or bacteria that could be harmful for the new trees. Subsequently, rice husk and compost were added to increase soil fertility.

Planting was conceived using three different planting schemes, depending on their location within the campus. Designs were made taking into consideration the special characteristics of every sector of the campus, since not all areas have the same features in terms of soil and terrain inclination. Group planting was preferred, following arboretum, triangular or hexagonal planting. In the case of arboretum, trees were planted with a three meters distance from one another; triangular designs have three trees planted on a four meters distance, while hexagonal designs correspond to a plantation formed by six trees with three meters distance from each other, forming an hexagon shape around a seventh tree, which is the main element of the arrangement. Spacing between hexagonal groups is of six meters, having in between a different bush acting as perch for attracting avifauna, crucial allies for the ecosystem recovery.

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In addition, as depicted on Figure No. 5, a “green wall” was created on the side of one of the outer University buildings, in order to enhance the natural beauty of the landscape and provide further greening to the University. With 14mts length and 6mts height, the green wall constitutes a gorgeous collection of several decorative plants that combine a variety of colors, textures, flowers and foliage.

#### **4 IMPLEMENTING AN ENVIRONMENTAL MANAGEMENT SYSTEM**

The idea of implementing an Environmental Management System at Politecnico Grancolombiano was originally conceived in the year 2004, when a group of lectures and directors working in the area of sustainable development presented a proposal for the implementation of an EMS at the university campus (Camacho, 2008). In early 2006, the adoption of an environmental policy was endorsed by the Chancellor and Academic Vice-Chancellor. However, the environmental policy was not properly disclosed and timing was not adequate for taking the proposal further.

By 2010, in conjunction with the beginnings of the ecological restoration plan for the University campus, it was decided to start a judicious process for the adoption of an EMS according to the Colombian national standard NTC-ISO 14001:2004 (ICONTEC, 2004), which is an adoption by identical translation of the International Standard ISO 14001:2004, Environmental Management Systems. Requirements with guidance for use.

As indicated on the ISO 14001 standard, an initial environmental review was conducted in order to identify the issues and objectives that should guide the establishment of an EMS at the Institution. For so doing, the toolkit provided in ISO 14004 (EMS – General guidelines on

principles, systems and supporting techniques) was used. Visual inspections of the premises were performed, as well as a careful characterization of all activities and processes. The applied methodology started with the implementation of face-to-face interviews with members of all university departments, the results of which were subsequently corroborated and verified against the outcome of visual inspections, as well as the information obtained through physical inspection of campus plans and archival material.

A matrix of environmental aspects was done, making a qualitative and quantitative evaluation of the environmental aspects and impacts identified on campus, and determining their level of incidence within the Institution. The result obtained allowed for the identification and classification of more than 170 environmental aspects with their corresponding impacts and levels of incidence. Similarly, a matrix of legal requirements was completed, identifying a total of 116 articles that the University must comply with; and designing the necessary activities to guarantee their full compliance.

#### **4.1 Environmental Policy**

According to ISO 14001, an environmental policy can be understood as a statement that reflects the “intentions and general principles of an organization in relation to its overall environmental performance, as have been formally expressed by the top management” (ICONTEC, 2004: 14). Thus, the adoption of an environmental policy by Politecnico Grancolombiano constitutes a written commitment of the University community to the fulfillment of its environmental objectives, as endorsed by the Chancellor and other institutional heads.

As previously stated, the first environmental policy of Politecnico Grancolombiano was adopted in the year 2006, but it lacked disclosure and was not part of a formal EMS. Therefore, in early 2011, the policy was revised and adjusted, finding its predecessor too broad, dense and impersonal (Quintana, 2012). The new -and currently valid- environmental policy, as approved and published by Politécnico Grancolombiano since 2011, reads as follows:

“Politécnico Grancolombiano University guides its activities with environmental responsibility in order to prevent pollution, optimize its resources and minimize its environmental impacts. To this end, it carries on strategies that ensure sustainability and compliance with current environmental legislation, and engages the university community in its goal of being an Institution committed to the continuous improvement of its environmental performance”.

Several communication campaigns were put in place in order to disseminate the policy among all university community. To this end, information is permanently disclosed on the institutional website, video-walls, and news magazines. Banners were deployed across the university campus and two promotional campaigns were implemented. In addition, with the support of teachers of environmental subjects, the environmental policy was formally presented to more than 600 students, encouraging them to exchange this knowledge with their peers.

#### **4.2 Main plans and programs**

The EMS that is been put in place at Politecnico Grancolombiano, has been conceived under four main programs: water and energy saving, environmental management of gardens, waste management, and environmental education; the latter being explained more deeply on the fifth section of the article.

#### **4.2.1 Water and energy saving**

As part of the water and energy saving plan, water saving valves were installed on every sink, and all university lighting were changed to the use of T8 LED energy saving bulbs.

The implementation of cleaner technologies was combined with strong communication campaigns for raising awareness on the significance of resource conservation via rational usage. Stickers were pasted in front of sinks and next to light switches, with short provocative messages allusive to resource conservation.

#### **4.2.2 Environmental Management of gardens**

The Institution has a team of five full-time gardeners, whom are permanently devoted to the maintenance and preservation of the new plantations. For the management of gardens a quarterly schedule is developed, detailing specific activities to be performed every week, in terms of fertilizing, spraying, irrigation and maintenance.

Soil fertilizers are used in order to strengthen the plants and provide the necessary nutrients for their healthy growth. In this process only organic fertilizers are used, namely E.M., Pennacore, Terravite, Flora and SSX, all of which serve specific purposes and are applied under strict frequency and quantity controls. Spraying is done using organic fungicides so as to keep trees free of any harmful fungi or other pathogens. Pests are thus controlled by means of biological control which allows the introduction, conservation and encouragement of natural enemies.

For irrigation, a drip irrigation method has been adopted, which has various technical and economic advantages, being a more sustainable way of irrigation. This system guarantees regularity on water tables, having stable humidity while gaining efficiency in water usage. Similarly, drip irrigation optimizes human labor, by increasing efficiency per workforce equivalent hour.

In addition a nursery has been established in the University premises in order to facilitate plants reproduction.

#### **4.2.3 Waste management**

Several activities and procedures have been performed in order to improve waste management within the university. For the proper handling of sewage pouring, 12 grease traps were installed at the university's food courts, with periodical maintenance and cleaning procedures scheduled.

The adequate handling of hazardous waste has also been fully considered. The procedure known as "Proper management of hazardous and/or non-conventional waste" was established, for the adequate handling and labeling of all hazardous waste generated on campus. In addition, the "Proper management of hazardous waste Plan"-or PGIR for its acronym in Spanish- was completed, which was fully revised by the environmental authority.

Similarly, a checklist was designed to verify all the requirements that transport providers must comply with, for the transportation of hazardous items. Concurrently with the elaboration of these plans, a training series was held with the personnel involved in these duties, to train them on proper waste management.

A special campaign was done, encouraging students and other members of the university community to bring in the electronic disposable items they had at home, in order to be adequately disposed of. The campaign was very successful and the proper treatment and final disposition of all items was achieved with the support of Bogota's District Environmental Secretariat.

Moreover, a recycling program has been initiated on campus, trying to raise awareness on the importance of an environmentally sound management of waste. The program is focused on source separation, favoring the proper use of potentially recyclable materials. In addition to the traditional sorting containers, recycling boxes have been distributed across campus for the sole separation of paper.

It is worth noting that, as opposed to more developed nations, Colombia lags behind international averages in terms of adequate separation and recycling of waste, which gives greater significance to the efforts made by any Colombian institution for promoting a culture of recycling within its community.

#### **4.3 Disclosure and Awareness Raising**

By the end of March 2011, Politecnico Grancolombiano conducted a two-days 'Environmental Journey' as part of the process of implementation of an EMS under ISO 14001:04 standards. During these two days, various activities were done with the main purpose of informing about the EMS and raising awareness about its importance for the whole university community. In agreement with the main programs conceived under the EMS, messages were focused on the importance of a rational usage of resources such as energy and water, the need of an adequate management of waste, and the preservation of the forest and gardens on campus.

On the first day of activities, an environmental fair took place at the main university square, with the participation of a group of companies and NGOs that were invited to present the activities and programs they have as an expression of their commitment with the environment. In addition, an environmental tale was performed, inviting to an adequate sorting and recycling of waste (see Figure No. 6). During the second day of the Environmental Journey, the group of gardeners from the Institution gave a gardening training to all interested participants, explaining in detail how the gardens on campus were planted, pruned, maintained and preserved in a sustainable way.

During the journey, visual media students were actively engaged, visiting all university departments and classrooms to present a recreational awareness raising campaign that emphasized on the proper use of energy and water, and the benefits of waste classification (see Figure No. 7).

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## **5 EDUCATING FOR SUSTAINABILITY**

### **5.1 The beginnings of education for sustainable development**

The early days of education for sustainable development at Politecnico Grancolombiano date back to mid-2002, when the institution started to work on its commitment to sustainability in accordance with the University Mission, which states that Politecnico Grancolombiano is an “institution of higher education, created for making a sound contribution to the socio-economic and cultural development of the country...through an education that is based on respect for human rights, the integral development of human personality, the upbringing of intellectual autonomy, [and] the insertion and participation of our country in international socio-economic processes...”.

At this point in time, the ‘Institutional project of sustainable development’ was presented by a group of teachers and directors that were familiar with and interested about sustainable development. As part of its strategy, the program emphasized the key importance to include subjects related with the study of environmental and sustainability concepts that were relevant to the study programs available at the university (Camacho, 2008).

As a result 9 sustainable development related courses were initially offered to students of some of the academic programs of the university, including accounting, business administration, international business, marketing, journalism, industrial engineering and audiovisual media. The specific courses offered included: new technologies and the environment, communication and sustainable development, anthropology of consumption, environmental accounting, human kind and the environment, environmental management, management for sustainable development, technology and environmental management; and cleaner and sustainable production.

### **5.2 Adopting cross-cutting environmental and ethics education**

In agreement with the idea of implementing an environmental management system at the university, and trying to give more coordination and coherence to the development of education for sustainability at the institution, it was decided to provide cross-cutting environmental and ethics education for all students enrolled at the university. Thus, since the first semester of 2008, two new courses were designed and incorporated into the general institutional track offered indistinctively to all university programs. The curriculum of which were conceived in an interdisciplinary way that will allow students from all disciplines to gain the knowledge and skills needed to understand the complex environmental and social issues, and analyze them in an ethical and responsible way.

As a result, currently all of the more than 16,000 students enrolled at Politecnico Grancolombiano, both for on-campus and online education programs, are taking two mandatory courses that reinforce the environmental and social aspect of education for sustainability, namely i) environmental culture and ii) ethics. As part of these courses, students develop applied research projects, such as reports, videos, posters and publications that elucidate their growing interest and knowledge about the main environmental and social challenges of our time; reflecting on how young professionals, individually and collectively, may respond to them.

In addition, some other subjects for sustainable development education, that were considered by program directors as a key complement for the integral training of professionals in their field, were kept as part of the program curriculums; some been offered as mandatory courses while some are available as electives.

The chart below summarizes the sustainable development education courses currently available at Politecnico Grancolombiano:

**Chart No. 1. Education for sustainability at Politecnico Grancolombiano**

| <b>Course name</b>                                 | <b>Type of course</b>           | <b>Available to</b>                                 |
|--|---------------------------------|---|
| Environmental culture                              | Mandatory (institutional track) | All university programs                             |
| Ethics   | Mandatory (institutional track) | All university programs                             |
| Environmental and sustainable management           | Mandatory (program track)       | Undergraduate degree in business administration     |
| Sustainable development and international business | Mandatory (program track)       | Undergraduate degree in international business      |
| Communication and sustainable business             | Elective                        | Undergraduate degree in marketing and communication |
| Green markets                                      | Elective                        | All university programs                             |

Source: Own construction

### **5.3 Research and outreach**

For more than six years already, the research group from the School of Administration, Economics and Accounting at Politecnico Grancolombiano has been carrying on research work about sustainable development issues; having since 2011 a research line entirely devoted to the analysis of sustainability. Currently, the School researchers are carrying on projects in the areas of biofuels, water markets, corporate social responsibility and inclusive business.

In addition, as one of the options for obtaining their undergraduate degree, business administration students are offered, since 2010, the possibility to enroll in an intensive 120-hours graduate certificate on corporate social responsibility [CSR]. Since its inception two years ago, the participation and enrollment of students in this optional degree has grown significantly, which means that by September 2012, nearly 200 young business administration professional would have graduated from Politecnico Grancolombiano with

well-rounded education that combines mandatory courses on sustainable development education (as included on the program curriculum) with this intensive training on CSR.

Moreover, as an expression of its commitment with sustainability, Politecnico Grancolombiano, under the leadership of the School of Administration, Economics and Accounting, held during the first semester of 2012 the special seminar called “Business, environment and development”. The course lasted 16 weeks, and corresponded to the Institutional event *Cátedra Jaime Michelsen Uribe*, which is held once per year as an academic forum for promoting the dialogue and study of themes of great significance for the university community and Colombian society. In this opportunity, the university decided to devote this institutional event to the analysis of sustainability from a systemic view, by simultaneously addressing the social, economic and environmental aspects of sustainable development in each one of the sessions.

## 6 RESULTS TO DATE

The results obtained so far are very satisfactory and reinforce Politecnico Grancolombiano’s commitment to sustainable development. It is important to highlight that the whole process has count with the decided and permanent support from the Institutional heads, starting by the University Chancellor, which has strengthen the environmental awareness among the entire university community and has given a premier role to both, the restoration and the EMS projects.

The campus recovery process prognoses a successful example of restoration of the eastern hills of Bogota, increasing from 1,000m<sup>2</sup> to nearly 9,000m<sup>2</sup> of gardens. By the end of the third and last phase of the campus restoration plan, the total area with native plantations will exceed 14,000m<sup>2</sup>. As of the time of writing of this article, only 12 months have passed since the planting of the 500 native bushes corresponding to the first phase of the restoration plan. Although been a very short time span, after just one year the first signs of ecosystem recovery are already visible, having spotted several insects and avifauna, such as ladybugs, butterflies and hummingbirds that had long ago migrated away from the eastern hills of Bogota as a consequence of its degradation. Similarly, an owl has been seen in the area, most likely attracted by the presence of squirrels and other rodents. It is expected that in a three year time frame the plantations have reached heights and foliage that, together with the presence of native animal species, make of Politecnico Grancolombiano’s gardens a close representation of a natural Andean forest, recovering the resilience of the native ecosystem.

Progresses made with the implementation of the EMS plans and programs are equally remarkable. Improvements in waste management are notorious, particularly hazardous waste that had been accumulated throughout years of operation, with 4,347 kg of electronic waste properly managed. The Institution is now implementing a strict control of all hazardous waste generated on campus, having an adequate warehouse for its temporary storage, while it is properly transported and disposed by an authorized firm. Besides, since the inception of the recycling program one year ago, 1,346kg of recyclable material have been recycled through recycling organizations in Bogota that can effectively reincorporate all these useful materials into the productive value chains. As for economic gains, the proper management of waste has generated significant cost savings for the university, reducing in about 90% the monthly fee paid for garbage collection (Quintana, 2012).

As a result of program monitoring and evaluation, some difficulties were identified for the proper sorting of recycled materials, due to lack of understanding by the university community of how to use the different wastebaskets provided for each type of resources. Therefore, a new supporting campaign has been designed in order to facilitate the proper visual identification of the containers, with new labeling for each wastebasket type. The campaign will be strengthened with informative videos and recreational parades that will creatively explain the proper way of waste sorting.

In terms of the adoption of an EMS, Politecnico Grancolombiano University is currently on the implementation phase. In the coming months, and prior to the end of 2012, the Institution will start the process of auditing and verification by training internal audits, with an aim to obtaining the EMS certification by the year 2013.

## 7 CONCLUSION

Politecnico Grancolombiano is a Colombian institution of higher education that has adopted sustainability as one of its cornerstones. Until now, this pledge has had the permanent support from the Chancellor and other institutional heads, which on its own has fostered the interest and commitment from the entire university community, whom feel increasingly involved in the attainment of sustainable development.

By means of its campus restoration and its adoption of an environmental management system, Politecnico Grancolombiano has become a country leader in the environmental area, positioning as a Green University highly committed to sustainability.

From here on, the Institution will strengthen its Social Mission, furthering sustainability from a social, economic and environmental viewpoint; focusing on the benefit of minorities, vulnerable groups and the environment, through programs and projects to be "sewers of change".

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<sup>1</sup> DAMA is the Spanish acronym for “Departamento Administrativo del Medio Ambiente”, or Administrative Department for the Environment. Established in the 1990’s, DAMA was the public entity in charge of the protection of the environment at the local level in the capital city of Bogota. Since 2006, under Decree 561, DAMA was re-structured and its duties and mandate fell within the domains of the newly created District Secretariat for the Environment.

<sup>2</sup> In Colombia’s National Environmental System, Regional Autonomous Corporations are the first regional environmental authority. They are public corporate entities created by law, having financial and administrative autonomy, and with the mandate to watch over the proper management of natural resources aiming for the sustainable development of their jurisdiction. The Corporación Autónoma Regional - CAR – operates for the city of Bogotá and the department of Cundinamarca.

## FIGURE CAMPTIONS

- Figure No. 1: Major plant diseases found on the eucalyptus at Politecnico Grancolombiano
- Figure No. 2: Large trees with significant loss of verticality and risk of falling (behind: K-building to the right of the University main entrance. See figure No. 5 for before and after comparison)
- Figure No. 3: Panoramic of the restored campus with native species
- Figure No. 4: Panoramic of the restored campus with native species
- Figure No. 5: “Green wall” located on the outer wall of K-building, to the right of the University main entrance (see figure No. 2 for before and after comparison).
- Figure No. 6: Student actors and actresses performing at the environmental tale
- Figure No. 7: Students participating at the recreational parade for proper waste management awareness raising