

## A teacher's perspective on the interactions between the United Nations' SDGs

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### Abstract:

Heads of State and Government, senior UN officials and representatives of the civil society met in September 2015 as part of the 70th session of the UN General Assembly, and adopted the Sustainable Development Goals (SDG). By 2030, these objectives form a program of Sustainable, Universal and ambitious Development, a program "of the people, by the people and for the people", conceived with the active participation of UNESCO.

### Key Words:

SDGs, sustainable development, education, teacher

### Abstrakt:

Vedoucí představitelé států a vlád, vedoucí představitelé OSN a zástupci občanské společnosti se v září roku 2015 setkali v rámci 70. zasedání Valného shromáždění OSN a přijali Cíle udržitelného rozvoje (SDG). Do roku 2030 tyto cíle tvoří program udržitelného, univerzálního a ambiciózního rozvoje, programu "lidí, lidmi a pro lidi", koncipovaných s aktivní účastí UNESCO.

### Klíčová slova:

Cíle udržitelného rozvoje, udržitelný rozvoj, vzdělávání, učitel



## 1. The UN Sustainable Development Goals

Heads of State and Government, senior UN officials and representatives of the civil society met in September 2015 as part of the 70th session of the UN General Assembly, and adopted the Sustainable Development Goals (SDG). By 2030, these objectives form a program of Sustainable, Universal and ambitious Development, a program "of the people, by the people and for the people", conceived with the active participation of UNESCO.

These objectives are:

1. End poverty in all its forms everywhere
2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture
3. Ensure healthy lives and promote well-being for all at all ages
4. Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all
5. Achieve gender equality and empower all women and girls
6. Ensure availability and sustainable management of water and sanitation for all
7. Ensure access to affordable, reliable, sustainable and modern energy for all
8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all
9. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation
10. Reduce inequality within and among countries
11. Make cities and human settlements inclusive, safe, resilient and sustainable
12. Ensure sustainable consumption and production patterns
13. Take urgent action to combat climate change and its impacts
14. Conserve and sustainably use the oceans, seas and marine resources for sustainable development
15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss
16. Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels
17. Strengthen the means of implementation and revitalize the global partnership for sustainable development
18. Welcoming migrants

These objectives are not compartmentalized; they cannot be taken into account separately because they are connected to each other by cause-and-effect relationships that make them interdependent.

## 2. The relationships between SDGs

There is a growing literature on the interactions between SDGs. Let's quote Leblanc (UN DESA, 2015), who presents a mapping of these interactions from the political point of view. Indeed, he studies the links between SDGs by counting the number of targets that they share in pairs, these targets being the result of the political process that led to the United Nations Sustainable Development Goals. Let's quote, too, Nilsson, Griggs and Visbeck (Nature, 2016) and the publication of the International Council for Science (2016), where the interactions between SDGs are approached from a scientific point of view, a methodology being proposed to quantify the intensity and direction of relations between SDGs.

The approach taken in this work is different. It is a bottom-up approach where the interactions between SDGs are approached from a teacher point of view. They will be described first, then they will be graphically represented to show how the interactions between sustainable development goals are perceived by an ESD practitioner.

The map that will be obtained can be compared to those proposed by Leblanc (2015, pp. 5 and 12). The differences and common points between these maps can be observed, and recommendations can be got on how to communicate on the SDGs and integrate them into the teaching on Sustainable Development.

## 3. A textual presentation of the relationships between the SDGs

...from Dr. Françoise Laveuve's, teacher, point of view

### SDG 1: Eliminating poverty in all its forms and all over the world

SDG 1 implies taking into account all that generates poverty, and all its consequences, which are different, according to the country, or the region, or, more, according to the hemisphere of the planet, North or South. For example the word "poverty" implies malnutrition or even starvation (SDG 2), illness and suffering, too often death (the opposite of well-being, SDG 3), inequality at school, or, even worse, the inability to have access to education and vocational training (SDG 4), all that increasing and perpetuating poverty in the world, and making it more and more difficult to be eradicated, especially as the population keeps growing in the world. Poverty, food security, health are undermined, especially in the South, by the unequal distribution of water resources on the planet (SDG 6), a problem aggravated in some countries by the consequences of global warming (SDG 13). And how to get a "quality education" (SDG 4) when so many students in the Southern Hemisphere do not have electricity at home and are obliged to learn their lessons under a street lamp before it's off? And when war and/or poor economic conditions oblige people to leave their country, at their lives and those of their children' risk, and emigrate for better conditions of living in another country, all the Sustainable Development Goals are implied to enable them to have better conditions in their new life. This is to say the crucial importance of this SDGs definition and the links between them.

Nowadays, one billion people, that means one in seven, lives on less than \$ 1.9 a day, which is the extreme threshold of poverty. And the reduction of global poverty is likely to be undermined by the new economic deterioration in many parts of the world, and by the scarcity of quality jobs worldwide. Working is not a guarantee against poverty. Indeed, "More than 80% of the working poor have a job with a salary," according to the International Labor Organization (ILO) in its report "Employment and social issues in world 2016" presented in Geneva on 18 May 2016 on the eve of the 105th International Labor Conference opening.

SDG 8 (Promoting full and productive employment and decent work for all) is therefore also involved in achieving SDG 1.

## **SDG 2: Eliminating hunger, ensuring food security, improving nutrition and promoting sustainable agriculture**

SDG 2 cannot be separated from SDG 1 ("Eliminate poverty"): they are dependent on the same SDGs, but SDG 2 is also dependent on SDGs 12, 13, 14 and 15, giving the solutions to make it possible to eradicate hunger in the world, being in charge of sustainable consumption and production patterns, the fight against climate change, the conservation and exploitation of the oceans in a sustainable way, and the preservation and restoration of terrestrial ecosystems.

According to sources such as FAO and WFP, one in nine people in the world is suffering from hunger (795 million people), and the vast majority of hungry people live in developing countries, where 12.9% of the population is undernourished. But in sub-Saharan Africa, one in four people is undernourished, and malnutrition causes the death of 3.1 million children under five every year, nearly half of the causes of death (45%). Malnutrition leads to delayed growth (one in three children), and therefore health problems (SDG 3) as well as school difficulties (SDG 4). 66 million children of school-going age in the world go to school without having eaten anything, 23 million of them in Africa. According to WFP estimates, it would take \$ 3.2 billion a year to feed the 66 million children of school-going age who are hungry.

FAO's archives explain that, formerly, FAO's records explain that, before, farmers who practiced subsistence farming were planting and using traditional food crops because they were familiar with these practices. They knew these plants well, selected good varieties according to the requirements and constraints of the environment, and used their own seeds to obtain safe harvests. Only few inputs were needed, the work force was available within the family, and the seasonal requirements of traditional plants were well suited to conventional farming systems, including intercropping, shifting cultivation and fallowing.

Some social and customary motivations also justified the choice of traditional cultures. So, they needed sorghum to brew beer for ceremonies and festivities. Cassava and wild vegetables served as transition foods in the off-season, before harvest and during the first rains. Cassava was extracted from the soil as and when needed; mils and sorghums were stored in jars at home or in granaries. The cucurbits also had a good conservation, and the oil was drawn from their seeds.

Today, many traditional food crops, such as yam or cassava, have become scarce and expensive, as traditional societies evolve towards a cash economy and patterns of buying industrial food that undermine both the food system and traditional agriculture. The saturation of local markets with cereals coming from intensive crops grown abroad, of much lower nutritional quality than traditional cereals, but very cheap, do not encourage farmers to continue cultivating their traditional seeds, and children are less well nourished. On the other hand, since traditional farming requires a lot of manual labor, most of the time carried out by women, who are already overworked, women, because of lack of time, give preference to bread made of wheat, or rice, or corn, which require less work. Thus, SDG 12 is very important to help solving the problem of hunger in the world, problem aggravated by the increase in desertification in countries already naturally dry, as a result of global warming, deforestation and climate change, and also the drying up of rivers once rich in fish, as well as all the disasters associated with the destruction of terrestrial ecosystems (SDG 15).

### **SDG 3: Ensuring healthy lives and promoting well-being for all at all ages**

SDG linked to SDG 2 and its corollaries, involves in addition SDGs 5, 11 and 18 corresponding to: gender equality and empowerment of all women and girls, making cities and human settlements inclusive, safe, resilient and sustainable, and welcoming migrants. Health is a total state of physical, mental and social well-being that enables everyone to realize their potential and do their best at work, with their families and in society. In addition to health, for some people, well-being refers to a set of material goods that allow a better quality of life. For others, well-being will be first and foremost an inner state. The concept of well-being is personal, but it is dependent on the functioning of a given society, its customs and specific codes.

An economy of well-being does exist, it is a branch of Economy, the main purpose of which being to provide and making available to all sectors of society the services and means necessary for a dignified life for all.

In the UNESCO Charter, the health sector has the most basic goals: a total of 13, subdivided into proposals, resulting in a total of 26 indicators. Let's mention goal 3.3: "By 2030, put an end to the following epidemics: AIDS, tuberculosis, malaria and tropical diseases, and fight hepatitis, waterborne diseases and other communicable diseases." In middle- and low-income countries, four out of ten children do not reach the age of 15. Infant mortality is one of the main characteristics of poor countries. This is explained by the weakness of the immune defenses of children related to malnutrition, but also the lack of access of the population to safe drinking water (SDG 6). In Tanzania, for example, where the water resource is the marigots water, which is not drinkable, out of ten children who die, nine die because of this unhealthy water.

With regard to deadly viruses, according to WHO, in despite of a considerably improved caring, and countries being more and more aware of the issue, the viruses are still spreading. HIV is doing damage mainly in sub-Saharan Africa (1.1 million deaths), but also in Asia (250,000 deaths). In more developed areas, there are approximately 100,000 deaths. And if the number of deaths has decreased compared to the year 2000 (200,000 fewer deaths), every day 5700 additional people are infected by the AIDS virus.

Let's also quote point 3.9: "By 2030, substantially reduce the number of deaths and illnesses due to dangerous chemicals, as well as pollution, and air, water and ground contamination."

The first global estimates published to date on food-borne diseases show that every year nearly 600 million people, or 1 in 10 people, become sick from eating contaminated food, and that 420,000 die from it, of which 125,000 children under five, according to the World Health Organization's document « Estimates of the Global Burden of Foodborne Diseases », the most complete report to date on the impact of contaminated food on health and the well-being. The report puts the burden of disease on 31 pathogen agents, bacteria, viruses, parasites, toxins and chemicals. It is in the WHO regions of Africa and South-East Asia that the burden of disease attributable to these diseases is the highest.

Finally, SDG 3 is linked to SDG 5 because the woman is the pillar and epicenter of all activities in society. The quality of the family's food, the health of her children, their education, and, in a general way, the well-being of those around her depend on her. However, women are the most disadvantaged, the most exploited and the most vulnerable social class in the world. So living in good health, promoting the well-being of all depends largely on the degree of empowerment of women.

## **SDG 4: Ensuring inclusive and equitable quality education and promoting lifelong learning opportunities for all is fundamental.**

The success of all the other goals, to which it is undeniably connected depends on this goal. The right to education is a vital right, indispensable to the exercise of all other human being rights. It promotes individual freedom and empowerment. However, millions of children and adults remain deprived of the opportunity to receive an education, most often because of poverty.

According to the Standing Group Against Illiteracy (SGAI), there are more than 860 million illiterates in the world, or two out of five adults; in addition, UNESCO's statistics indicate that 21% of women in the world cannot read, one in five women compared with 12% of men. This disparity is explained by the fact that, in many developing countries, for reasons that are mostly economic, girls are asked to stay at home to help with housework while the mother goes to the fields to cultivate the food of the family.

Learning to read and write is an inescapable right. Yet, in Africa, 38% of adults (about 153 million) are illiterate, two-thirds of them are women. The situation is alarming as literacy provides the basic skills needed to cope with the many challenges that children, young people and adults are facing throughout their lives. For many disadvantaged young people but also adults, non-formal education is one of the main pathways to learning. It makes it possible to reach populations taking into account their own context and using their own local language. For example, in Tanzania, illiterate but voluntary women were able to build and install small solar collectors in homes, producing electricity for the very first time in the village. This example shows that illiteracy does not mean lack of capacity, but deprives human beings of the manifestation and expression of their own abilities.

From the perspective of Education for All, UNESCO has therefore defined six major goals to address the learning needs of all children, young people and adults - with special attention to education for the most disadvantaged and for girls - and enabling everyone, through a continuing education program, to develop the skills and competencies needed to meet all the challenges of today's world.

## **SDG 5: Achieving gender equality and empowering all women and girls**

Because of inequality between men and women, the women and the girls in the world must have to face discrimination and violence, they are excluded from education (SDG 4) and deprived of their fundamental rights without having the opportunity to ask for help. (SDG 14).

While violence against women is a universal phenomenon, many women are victims of specific forms of violence because of some aspects of their identity. The more young, illiterate, and poor they are, the more vulnerable they are, and the more difficulties they have to flee the situations in which they are abused, to obtain protection, and to seek redress from the judiciary. Discrimination and poverty (Goal 1) are both factors and consequences of violence.

Discrimination denies women equality with men in all areas. In other words, the consideration – or not – towards women is conditioned by their status and this status is strongly conditioning the definition of what will or will not be considered as unacceptable. To various degrees in different countries, violence against women occurs because laws, policies, and traditions discriminate against them, politically, economically and socially, creating an

environment of impunity conducive to reducing them to silence and let them be subject to abuse.

There are sixty million "missing" women in the world's population, the majority of them living in East and South Asia. They are victims of malnutrition, lack of care, abandonment. During their early childhood, girls are less nourished, they receive less nutritious foods, their breastfeeding is shorter; in addition, their visits to health centers are more distant and they are less frequently vaccinated.

Moreover, today 130 million girls are deprived of education (SDG 4), which is a fundamental right, for various reasons: parents' lack of financial means, wars, lack of teachers in some countries or regions, but especially violence and discrimination.

The impact of violence against women is spreading to the whole family and the surrounding community. Children who live in a climate of violence are at risk of becoming victims of violence themselves and perpetrating it. Violence affects the physical and mental health of women and their children, threatens their safety on all levels, and undermines self-esteem and well-being (Goal 3).

Violence against women is therefore a factor of economic, political and cultural impoverishment for society. It prevents women who suffer from it from playing an active role in local development (SDG 8).

There is nothing like forced and early marriage to deprive a girl of her freedom and autonomy. Every year, more than 15 million girls are forced to marry before the age of 18, and are reduced to dependency, helplessness and poverty. They have no future. In societies that practice forced marriage, women and girls have lower status than men, and their well-being is not a priority.

In developing countries, one in three women is forcibly married before the age of 18; poverty is often the cause, a girl being considered as a burden. The absence of a birth certificate is another reason: three hundred and fifty million children have not been registered at birth, and girls, having no legal identity, cannot provide evidence of their young age, which would prove the illegality of an early marriage. In many countries, even when early marriage is prohibited, many families break the law and are not prosecuted. Finally, emergencies, conflicts, natural disasters, increase the economic pressure on families, and the number of early marriages increases.

This often results in sexual violence and abuse by husbands, health risks related to early pregnancy, the leading cause of death for girls aged 15 to 19, and HIV-related risks because the girl is rarely able to negotiate safer sex. Finally, the school drop-out, in addition to the unjust situation it generates for girls, represents a huge loss of the communities development potential and countries (SDG 4).

## **SDG 6: Ensuring availability and sustainable management of water and sanitation for all**

SDG 6 is linked to the concepts of poverty, famine, diseases and epidemics, due to the unequal distribution of water resources on the planet, a problem aggravated by the climate change, water pollution, desertification, and the destruction of terrestrial ecosystems, among other disasters. More than one billion people do not have access to safe drinking water, or improved quality water, in the world.

The water crisis is such that, if nothing is done, the world will have to face a water deficit of 40% by 2030, according to the experts of the United Nations World Program for the Assessment of Water Resources in the 2015 Annual Report of the United Nations on Blue Gold. Inextricably linked to climate change (SDG 13), agriculture and food security (SDG 2), Energy (SDG 7), Health (SDG 3), and even gender equality (SDG 5), water is the theme that best illustrates the three pillars of sustainable development: fight against poverty (SDG 1), economic development (SDG 8), and ecosystem preservation (SDG 15). The report highlights how water scarcity and mismanagement are creating tensions and conflicts around the world.

Underground aquifers provide drinking water for half of the world's population. But one in five is overexploited. Largely devoted to intensive irrigation, excessive picking favors salt inputs, making water, ultimately, undrinkable. With rising sea levels, major cities like Shanghai in China are seeing the quality of freshwater aquifers threatened. In terms of unsustainable exploitation of the underground resource, India is often quoted. The number of wells has increased considerably in the last 50 years, due to the sharp increase in agricultural productivity, but the choice of irrigation is causing serious pollution, and often deprives traditional smallholders of the water required for irrigation of their fields, because it is diverted by large multinationals for the benefit of their intensive farms.

Water sanitation is another major global challenge. In its annual report on water resources released in March 2014, the United Nations states that 3.5 billion people do not have safe, clean, accessible and affordable water from a well or from a source in which the animals do not drink as well. Behind this fact lies a daily suffering, especially for women when they seek to isolate themselves, for girls who drop out of school because there are no toilets, and for children suffering from waterborne diseases.

In addition, the UN are concerned about the impact on the environment of 80% or 90% of wastewater released onto the planet without treatment.

Carried by the United Nations this SDG seems on track to reach its goal, but it is progressing with huge disparities. An inhabitant of the United States uses an average of 300 to 400 liters of water a day, a European from 120 to 150 liters, and an African from the sub-Saharan regions only has 20 to 30 liters a day.

## **SDG 7: Ensuring access for all to reliable, sustainable and modern energy services at affordable cost**

SDG 7 is a challenge that all the countries are facing. Energy is at the center of almost every major challenge; Whether jobs, security, climate change, food production or increased incomes are concerned, everyone's access to energy is essential.

Yet one in five people in the world does not have access to electricity, and three billion people depend on wood, charcoal or animal waste (eg dried cow dung in India) to cook. and warm up. Because of this situation, children are struggling to find light for homework at night, families cook over an open fire, hospitals cannot put vital equipments in operation or keep drugs cold, companies cannot work at full capacity. Sustainable and reliable access to energy thus enable people to get out of poverty (SDG 1), to have access to healthcare (SDG 3), to be connected to the Internet as well as to mobile telephone networks, This opens the door to many opportunities for learning and economic activity (SDGs 4 and 8).

But energy is the main contributor to climate change, accounting for 60% of the world's total greenhouse gas emissions, so, reducing the carbon intensity of energy is a key goal in tackling climate change and its impacts (Objective 16).

Ensuring universal access to affordable electricity by 2030 therefore requires investment in green energy sources such as solar, wind and thermal power. Investment in energy efficiency technologies could also reduce overall building and industry electricity consumption by 14%. Expanding infrastructure and improving technology to provide green energy sources in all developing countries is a crucial goal that can both encourage growth and help the environment (SDG 9).

Sustainable energy presents promising opportunities in today's world that will transform lives, economies and the planet.

### **SDG 8: Promoting sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all**

SDG 8 is one of the three pillars of Sustainable Development, and is linked to almost all the other goals. It expresses all the governments and people's concerns around the world, at a time when, according to the International Labor Organization, we must expect unemployment to increase over the next few years (more than 212 million people will be unemployed by 2019 due to an increase in the labor force faster than labor market offers, and many more people will be trapped in precarious and poorly paid jobs).

At a February 2017 conference at Columbia University (New York), Jeffrey Sachs, a renowned economist and sustainability expert, professor of sustainable development, and professor of health policy and management at Columbia University (New York), referred to the Sustainable Development Goals as being the basis of the international cooperation for economic and social development for the period 2016-2030. He recalled that the 193 UN member states had agreed that "something was really problematic in the way the economy works". They also agreed on what "a decent world" means – i.e. a prosperous world where basic economic needs are assured; the population must be able to benefit from food security, not be poor, and have access to clean water and clean air. In addition, societies must be "just" in the sense that everyone must be able to meet their needs; where every child has a chance, where poor people do not have to fight to stay alive, or rush on any job to preserve the little dignity they have left in an economy that takes it off from them more and more every day; where women have the same rights as men. And let justice prevail.

For progress to be made, Jeffrey Sachs also says: economic growth must be spread out so that the greatest number of people will benefit from it: the wealth created must not only go to the top. It must also not destroy the environment.

Thus, Jeffrey Sachs is presenting the new economy as "smart, just and sustainable"; "intelligent in the ability to deploy technology to maintain productivity" and to "achieve economic security". In addition, he addresses the issue of equity, "so that the lion's share can't be found in a stock market", the securities being concentrated in very few hands.

At the same time, however, effective measures must be taken to abolish forced labor, modern slavery and trafficking in human beings. According to the ILO, nearly 21 million people are victims of forced labor: 11.4 million women and girls and 9.5 million men and boys. Nearly 19 million of them are exploited by individuals or private companies, and more than 2 million by a State or rebel groups. In addition, among those exploited by individuals or businesses, 4.5 million are subjected to forced sexual exploitation. In the private

economy, forced labor generates \$ 150 billion in illegal profits per year. Domestic work, agriculture, construction, manufacturing and entertainment are among the most affected sectors.

It is also necessary to mention the violation of the rights of the child forced to work. According to the ILO, about 168 million children worldwide (11% of all children in the world) are deprived of their childhood because they are involved in the work, and 115 million of them exercise dangerous activities, contrary to Article 32, paragraph 1, of the Convention on the Rights of the Child, which states that "States Parties shall recognize the right of the child to be protected against economic exploitation and not to engage him or her in any work that is dangerous or likely to jeopardize his or her education, or to harm his or her health and his or her physical, mental, spiritual, moral or social development. "

If the vast majority of children work in agriculture (59%) the worst forms of child labor are slavery, prostitution, involvement in the sale of drugs, crime, or enlistment as soldiers in conflict situations. See the UNICEF website of 31 May 2016: <https://www.unicef.fr/dossier/exploitation-et-travail-des-enfants>

Furthermore, migrant workers and indigenous peoples are also particularly vulnerable to forced labor.

This SDG 8 is in itself a huge challenge. But a challenge that Jeffrey Sachs considers to be within our reach.

## **SDG 9 - Building a resilient infrastructure, promoting sustainable industrialization that benefits everyone and encouraging innovation involves**

The world is in search of an effective growth strategy, where research plays a key role in the fields of Science, Technology, and Innovation (STI). It also involves sustainable basic infrastructure to improve the lives of global communities.

According to the May 2015 UN Magazine, "Many of the proposed Sustainable Development Goals will require a strong, functional and sustainable infrastructure if we want to achieve them.

"Reliable forms of energy, access to safe drinking water, education, security and social and economic services are possible through the development of a resilient infrastructure", that is to say an infrastructure enabling the systems (economic, ecological, human) to have the ability to regain their balance after a disturbance. Sustainable infrastructure does not only supports development, it is also essential for post-disaster recovery. For example, the Brazilian government has built hospitals that can withstand earthquakes and cyclones, while integrating infrastructure such as outdoor solar lights and rainwater collecting, which are both respectful of the environment, and therefore sustainable, but also indispensable after a disaster depriving the region of water and electricity.

Infrastructure must therefore meet societal needs (SDG 11) "but their long-term impacts should also be assessed, including the resources required to ensure their sustainability." Effective disaster risk management, linked to climate change, will help making infrastructure more sustainable through prevention. At the same time, risk reduction will help strengthen the ability of societies to withstand, confront and recover from shocks, in other words to strengthen their resilience.

Extreme weather events currently account for about 87% of natural disasters, and impact ecosystems, agriculture, and water resources around the world; sea level rises and storm tides increase. Therefore, it is no longer only a question of fighting against scourges by means of protective measures, but of taking into account the vulnerability of goods and people to hazards, in order to reduce their exposure to risks. The concept of vulnerability is now part of this risk prevention logic. A new thinking on risk management is therefore needed, including the vulnerability of companies. (Goal 13 and Goal 15).

Moreover, SDG 9 also aims to "promote sustainable industrialization that benefits everyone, and to encourage innovation". Indeed, efforts to address social and environmental challenges are visible in the long term only if they are supported by an economic growth. This is why UNIDO (United Nations Industrial Development Organization) promotes the Implementation of an Inclusive and Sustainable Development (ISID) in order to fully utilize the potential of industry in the service of development and of a sustainable prosperity for all.

Economic growth is based on entrepreneurship, continued economic diversification, increased trade relations, as well as industrial upgrading and technological innovation. Industrialization is an effective strategy for reducing poverty. But, according to UNIDO, progress in eradicating poverty will be short-lived if we fail to achieve the economic growth needed in a framework respectful of environment. And that is the transformation of the economic models production processes – which go hand in hand with the choice of adapted technologies - that will offer the best solutions to the pressing environmental challenges of our time.

## **SDG 10 - Reducing inequality within and among countries**

SDG 10 is a significant challenge, given the fact that almost half of the world's wealth is held by just 1 percent of the population. The persistence of inequalities in countries and from one country to another is the cause of an economic, social and moral problem for contemporary societies.

Inequalities between the populations of the poor countries of the planet and the populations of the rich countries are not limited to income disparities. They imply for poor countries very difficult living conditions, because access to basic goods such as food, health, housing, education, access to drinking water, energy, new technologies, remain problematic for them. In addition, the situation of women, already very difficult in many parts of the world, is aggravated. A constellation of different goals is therefore related to SDG 10.

Moreover, in many countries, wars, as well as the disorganization of economic structures, or the grabbing of land and wealth by a ruling elite, prevent the greatest number of inhabitants from reaching the subsistence level, while the better-off get richer and richer. In addition, the growth of productive activities, industry, construction, transport, also causes in some countries consequences that can be disastrous for the quality of life, health, peasant agriculture, and the environment in general.

But inequalities between rich and poor countries are not the only ones to be faced. Inequalities between the richest individuals and the poorest individuals within nations have increased dramatically in some parts of the world over the last 30 years. If this big problem is left unaddressed, the growing inequality between the rich and the rest of the population is likely to lead to growing social and political instability.

Reducing the gap between the richest and the poorest therefore occupies a central place in the Sustainable Development Goals. Especially since the issue of inequality is not just a social issue. It has consequences for the resilience of our growth models, our ability to protect biodiversity, and to establish a reliable energy and an ecological transition. Reducing inequalities within and among countries is not an end in itself, but a means to ensure the effectiveness and coordination of various sustainable development strategies.

## **SDG 11 - Making cities and human settlements inclusive, safe, resilient and sustainable**

SDG 11 is also a major development challenge. Since 2008, half of the world's inhabitants are living in cities. And the biggest cities are those that grow the fastest. Large metropolitan cities in developing and emerging countries are expanding rapidly due to rural-urban migration, high birth rates, and migrants hoping to find work and a better standard of living in the city. Large metropolitan cities are therefore at the heart of the organization of the world space.

In cities with a growing share of the population, socio-spatial segregation seems to be increasing, dividing the urban space. The urban division between rich neighborhoods and underprivileged neighborhoods is becoming clearer and clearer. In some cities, "closed neighborhoods" with controlled access are increasing. This phenomenon is particularly pronounced in cities in poor countries where 78% of the population is living in precarious housing. And on a global scale the situation is aggravated in some cities by social and racial segregation, or by conflicts.

The extension of cities also increases the displacements of inhabitants, resulting in a large concentration of vehicles, which generates a pollution harmful for the air quality, and hence for health. In addition, the consumption of fossil fuels is increasing. The improvement of urban networks and means of communication is an essential issue for a better management of cities.

But a better management of cities is not limited to the issue of transport, a sustainable response must be made to a certain number of needs, needs in terms of resources: for example promoting the use of renewable energy, improving the management of water, creating green spaces and woodlands to counter pollution; but still ensuring the needs in terms of services such as the treatment of wastewater, household waste and industrial waste, ensuring the population safety, setting up reception structures meeting ecological standards (high-quality housing and public buildings with a high environmental quality), passive energy houses, eco-neighborhoods developed according to the three pillars of sustainable development, not to mention leisure and cultural equipments.

These responses must be sufficient to meet the needs of large populations that should also be trained in order to be encouraged to adopt a lifestyle that would be more respectful of the environment and the sustainable development.

SDG 11 therefore implies SDG 18: the reception of migrants, but also Goal 16: Promoting peaceful and inclusive societies for sustainable development, ensuring access to justice for all, and implementing effective, accountable and inclusive institutions at all levels. SDGs 3, 4 and 5 are also relevant as cities must achieve the well-being of all, the opportunities for education for all, and the empowerment of all women and girls and gender equality.

## **SDG 12 - Ensuring sustainable consumption and production patterns**

This SDG is inseparable from SDGs 13, 14 and 15, among others. The initial purpose of agriculture is to satisfy the food needs of the population, but the level of damage to the environment has now often exceeded the thresholds of acceptability concerning soil degradation and chemical pollution. In many cases, the sustainability of agriculture itself is the cause. In addition, climate change is causing difficulties for all the world's agricultures, and requires adaptation, diversification, and the reduction of diffuse pollution. An in-depth transformation of the conventional agriculture basics is therefore essential to face the imperatives of economic efficiency by taking into account ecological realism. Immediate, medium-term and long-term measures are therefore needed.

Furthermore, we are currently wasting 30% of the global food production. We produce and consume without taking sufficiently into account the impact on the planet's resources. According to the European Commission, every EU citizen would waste 179 kilograms of food a year, so that, in total, taking into account what is lost in the chain of production, transport and storage, half of the healthy food would be lost, while 200 million people could have been fed around the world with this food that has been wasted in Europe.

This waste involves another waste: that of water. Thus, 250 km<sup>3</sup> of water are lost every year to produce lost or wasted food, a volume of water three times more than that of Lemman Lake. By 2050, the world's population is expected to reach 9.6 billion people: the current lifestyles of developed countries must be reviewed, especially since it is also clear to what extent the water resources of the planet are unequally distributed.

As a result, by 2030 SDG 12 aims to reduce by half the global food waste per inhabitant, both in terms of production and consumption, and, by 2020, to establish an ecologically responsible management of chemical products and waste treatment to minimize their negative effects on health and environment.

## **SDG 13 - Taking urgent measures to fight against climate change and its impacts**

SDG 13 is something crucial and indispensable. The warming of the climate system is unambiguous, it is manifesting by many observable phenomena such as, for example, the rise in atmospheric and oceanic temperatures, the melting of glaciers and polar ice caps, the rise in the level of the oceans, the increase in extreme weather events, changes in ocean currents, desertification, drying up of large rivers, lakes and rivers in the countries that are especially the most in need of water, all these phenomena having consequences on the food resources production, on economic activities in general, but also on the safety and well-being of the populations, all that implying particularly the SDGs 14, 15, 16 and 17 of the World Action Program.

Greenhouse gases are the main cause of global warming. The IPCC indicates that man appears to be responsible for 90% of the global warming through his activities - the power plants and the industrial processes being the largest emitters - followed by transportation, agricultural activities, as well as extracting and distribution of fossil energies. Agricultural production alone emits 60% of the nitrogen oxides present in the atmosphere, and 40% of methane, plus the 30% of methane emissions due to the extraction and distribution of fossil fuels. Energy plants and industrial processes emit about 50% of carbon dioxide.

Measures to fight against climate change and its consequences are therefore urgent; furthermore, because of the destruction of certain ecosystems, the disappearance of certain species and the proliferation of other species, which are essentially harmful, the acidification of the oceans and the increasing pollution of the air, an upsurge of infectious diseases and allergies is to be feared, and, for the poorest countries in the world, an increase in major mortality factors such as diarrheal diseases, malnutrition, malaria or dengue (a viral infection transmitted to humans by a special type of mosquito), so that SDG 13 is also linked to SDGs 1, 2 and 3. According to the Global Humanitarian Forum, the 325 million poorest people in the world, from 49 countries, will be the most affected by the climate change, while the United Nations estimate that 9 out of 10 disasters are now climate related.

Climate change is thus not only a destabilizing factor, it has become a factor of migration, which also links it to SDG 18.

### **SDG 14 - Conserving and sustainably using the oceans, seas and marine resources for sustainable development**

This is needed more than ever. Indeed, marine pollution is a scourge for the environment, it has harmful effects on living resources and marine ecosystems. As a result, there are risks for biodiversity, human health, and obstacles to fishing and aquaculture, which provide income for around 540 million people. SDGs 1, 3, 15 and 17 are therefore also concerned by this problem.

It is estimated that 70 to 80% of the waste found in the seas and on the coast is land-based, and that 60 to 95% of the debris found at the bottom of the sea is plastic waste and miscellaneous packaging. A true "plastic continent" has formed in the North Pacific, reaching the size of 3.5 million km<sup>2</sup>, or 6 times France area. Another continent, twice as large as France, has also been discovered in the northern Atlantic Ocean. These continents are formed by an accumulation of various kinds of waste, but they are largely composed of microparticles of plastic, which constitute a consequent danger for the marine fauna, in addition threatened by overfishing. According to the FAO, seven of the world's top 10 species of fishes are in the process of depopulation, and 29% of the fished species are threatened with extinction.

Marine biodiversity is also impacted by climate change. Since 1998, the "desert zones" of the ocean (without algae or fishes) have increased by 6.6 million km<sup>2</sup>, that is more than 15%, especially in the North Atlantic. In addition, the excess of fertilizer coming from sewage and agricultural waste has led to a proliferation of low-oxygen areas called "dead zones", where the major part of marine life cannot survive, and destroying some ecosystems by the same occasion. There are currently about 500 dead zones, with a total area of more than 245 000 km<sup>2</sup>, which is about the size of the United Kingdom.

SDG 14 therefore aims specifically to protect marine ecosystems and reduce their pollution, in particular by reducing ocean acidification, and by taking measures to limit illegal fishing. The United Nations Conference on the Ocean, held in New York from 5 to 9 June 2017, in parallel with the Ocean Day of 8 June 2017, has defined solutions to reverse this dramatic process that affects the planet and its inhabitants.

## **SDG 15 – Preserving, restoring and promoting sustainable use of terrestrial ecosystems, sustainably managing forests, combating desertification, halting and reversing the land degradation process and halting the biodiversity loss.**

Overexploitation of our planet's resources has resulted in degradations that could seriously endanger agriculture and our survival. Three-quarters of the world's 114 major crops depend on animal pollination, and more than 50% of medicines are produced from medicinal plants. If pollination does not occur, for example because of the shortage of specialized pollinators - bees and other pollinating insects, for example - fruit and seed production will be severely affected, which will cause serious problems in agriculture. Furthermore, as a result of deforestation and forest fragmentation, animal and plant biodiversity is rapidly declining.

Everybody knows that forests are the lungs of the earth; they cover 30% of the earth's surface, provide food security, and are essential for combating climate change, protecting biodiversity and sheltering indigenous peoples. Every year, intensive deforestation destroys 13 million hectares of forest. Meanwhile, the continuing degradation of arid lands has led 3.6 billion hectares of land to desertification. Deforestation and desertification, caused by human activities and the resulting climate change they have induced, represent major challenges to sustainable development, and they negatively impact the lives and livelihoods of millions of people struggling with poverty .

Healthy ecosystems are indeed the cornerstone of efforts to reduce poverty and develop sustainable agriculture, not to mention the need for increased water distribution networks, which are the foundation of development and growth. Many experts in agriculture, health and water are aware that deforestation and overexploitation of land could have a negative impact on the goals concerning the fight against poverty, ensuring food security and access to water for all, and allow everyone to live in good health (SDGs 1, 2, 3 and 6).

Forests therefore play a crucial role in many areas, including water resources, both in terms of quantity and quality. Their disappearance aggravates drought phenomena related to climate change to the point that fighting against deforestation is now a vital issue.

## **SDG 16 - Promoting peaceful and inclusive societies for sustainable development, ensuring access to justice for all and building effective, accountable and inclusive institutions at all levels**

This goal indicates the necessity and even the urgency of peace, justice, and the presence of effective institutions in a world affected by corruption, injustice and conflict with their attendant consequences. For example, in countries at war, 50% of children leave primary school, that is about 30 million children, which shows the impact of unstable societies on the implementation of one of the fundamental goals of the Global Action Program of sustainable development for 2030, the SDG 4: "Ensuring quality education for all". In addition, according to the United Nations, fraud, corruption, theft and tax evasion cost developing countries about \$ 1.26 trillion a year, while this amount could help for at least six years those living on less than \$ 1.25 a day. SDG 1 is therefore also largely concerned.

FAO calls for action against food insecurity in conflict zones (SDG 2). « Food security is an important foundation for peace, political stability and sustainable development. In the history of humanity, we have repeatedly observed the vicious circle linking violence and

hunger, and these conflicts are not delimited by national borders » said Graziano da Silva during a special meeting of the UN Peacebuilding Commission. And he added: "We cannot prevent a drought from happening, but we can prevent it from degenerating into starvation." For, while the conflicts impact is devastating in rural areas, the impact of these conflicts on food insecurity often persists long after the violence has ceased.

The advent of peaceful societies thus remains the ultimate goal of the United Nations ; that is why SDG 16 aims to reduce all forms of violence and the deaths that are due to them all over the world. It also aims to put an end to abuse, exploitation and trafficking and to finally eradicate all forms of violence and torture. For that, it is necessary to tackle the sources of violence and to imperatively reduce arms trafficking and illicit financial flows, as well as corruption, by 2030.

Finally, it is also important, according to the United Nations Organization for Peace and Justice, to involve all countries in a global governance agenda. The eighth goal of the Millennium for Sustainable Development promoted the establishment of an international partnership for development. This sixteenth SDG is inscribed in this perspective, by insisting on the necessity to act and strengthen the participation of developing countries in the Institutions in charge of global governance.

## **SDG 17 - Strengthening the means of implementation and revitalizing the Global Partnership for Sustainable Development**

This SDG is giving the list of all the measures that have been adopted in the areas of Finance, Technology, Capacity strengthening, Trade, Policy coherence and Institutional structures, Multi-stakeholder partnerships, and Data, Monitoring and application of the principle of Responsibility, by 2020 and by 2030, in order to achieve the Global Action Program. **All goals are concerned.**

Indeed, in order to carry out the 17 Sustainable Development Goals, it is necessary to be able to rely on a global funding base that exceeds the official development assistance funds. In addition to public and private funding, the political world must also make a greater contribution to achieving the goals. With this in mind, the international community agreed, in July 2015, on a new framework for financing and implementing the Sustainable Development: the Addis Ababa Action Agenda.

Under SDG 17, developed countries renew their commitment to allocate 0.7 per cent of their gross national income as an aid to the developing countries. On the other hand, in order to limit the dependence of these countries on foreign support, a national resource mobilization, an international collaboration in the fields of science, technology and innovation, as well as the promotion of a fair multilateral trade are favored, while macroeconomic stability and policy coherence in favor of sustainable development are also encouraged.

## **SDG 18 - Welcoming Migrants**

Including Migration in the United Nations Sustainable Development Goals is an important step. William Lacy Swing, Director General of the International Organization for Migration (IOM), called on the member states of the United Nations Summit on Sustainable Development in order to "address the causes and consequences of migration so that promoting a safe, dignified and orderly migration, for the benefit of all. "

Concerted and coherent international partnerships are imperative to achieve this goal. As the lead Migration Agency, and in cooperation with governments, the United Nations system and civil society, IOM will help to ensure that the 2030 Agenda for Sustainable Development goals on migration are achieved, making migration a human and dignified process.

The 2030 Agenda recognizes the positive contributions of migrants and their fundamental role in Sustainable Development. Migration and human mobility are integrated in four of the 17 Sustainable Development Goals (SDGs 11, 13 (Climate Migration), 16, 17). And responsibility is placed in the hands of the international community, which must engage, in the sustainable development framework of Agenda 2030, to "ensure a safe, regular and orderly migration, with full respect for human rights and in a humane manner, regardless of their status as a migrant, a refugee or a displaced person", and that this commitment must be a reality, a well managed migration being a force for the international development.

Current migratory realities make it a crucial goal: one in seven people in the world is a migrant, i.e. about 1 billion people, and billions more are affected by daily migration. Violence and conflict have displaced 38.2 million people inside their own countries and are contributing significantly to the refugees population, which now numbers 19.5 million people, according to the United Nations High Commissioner for Refugees (UNHCR). Sustainable Development can only be achieved by integrating all vulnerable groups. The integral role that migrants play in Sustainable Development cannot be underestimated. Migrants should not be left behind.

IOM is committed to helping governments to meet these ambitious commitments, and is developing a Migration Governance Index that will help to strengthen the capacity of governments to create successful policy frameworks and migration strategies.

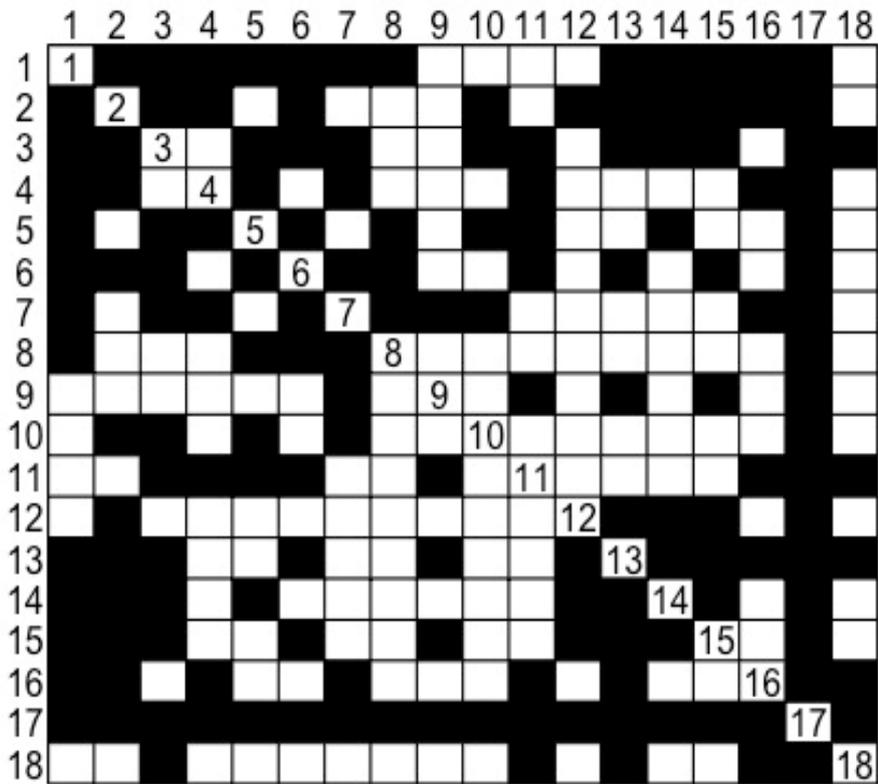
## Conclusion

Studying the interrelations between the 18 Sustainable Development Goals is showing how much the 2030 Agenda for Sustainable Development adopted by the United Nations in September 2015 is crucial. Mrs. Irina Bokova, General-Director of UNESCO, has written in her Editorial of the April-June 2017 *UNESCO Courier* that it is representing: "a humanistic turning point in global development policies, building on peoples' capacities to meet the challenges of peace and climate change, through education, science, and culture, which underlie each of the Sustainable Development Goals. „

## 4. A visual exploration of the relationship between the SDGs

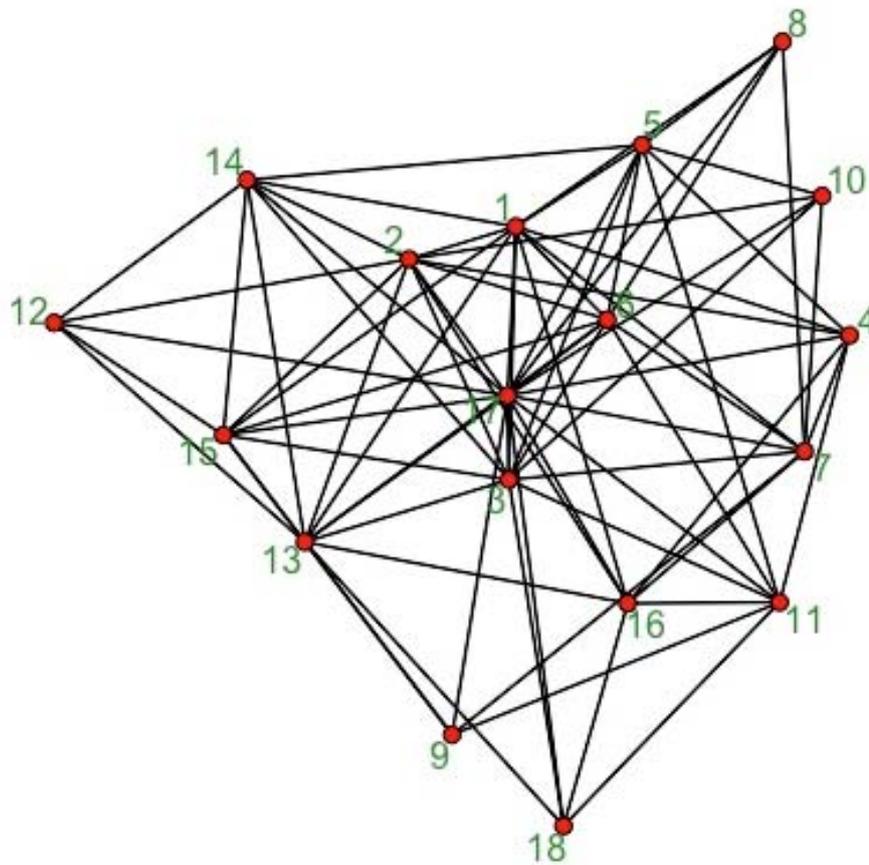
...from the point of view of Françoise Laveuve, Doctor

In order to synthesize the relationships, previously highlighted, existing between the eighteen Sustainable Development Goals, and in order to represent them graphically, we construct the adjacency matrix below.



It reads as follows: for example, SDG 1 is linked to SDGs 2, 3, 4, 6, 7, 8, 10, 13, 14, 15, 16 and 17. A box in black at the intersection of the  $i$ -th line and the  $j$ -th column indicates that there is a link between SDG No.  $i$  and SDG No.  $j$ .

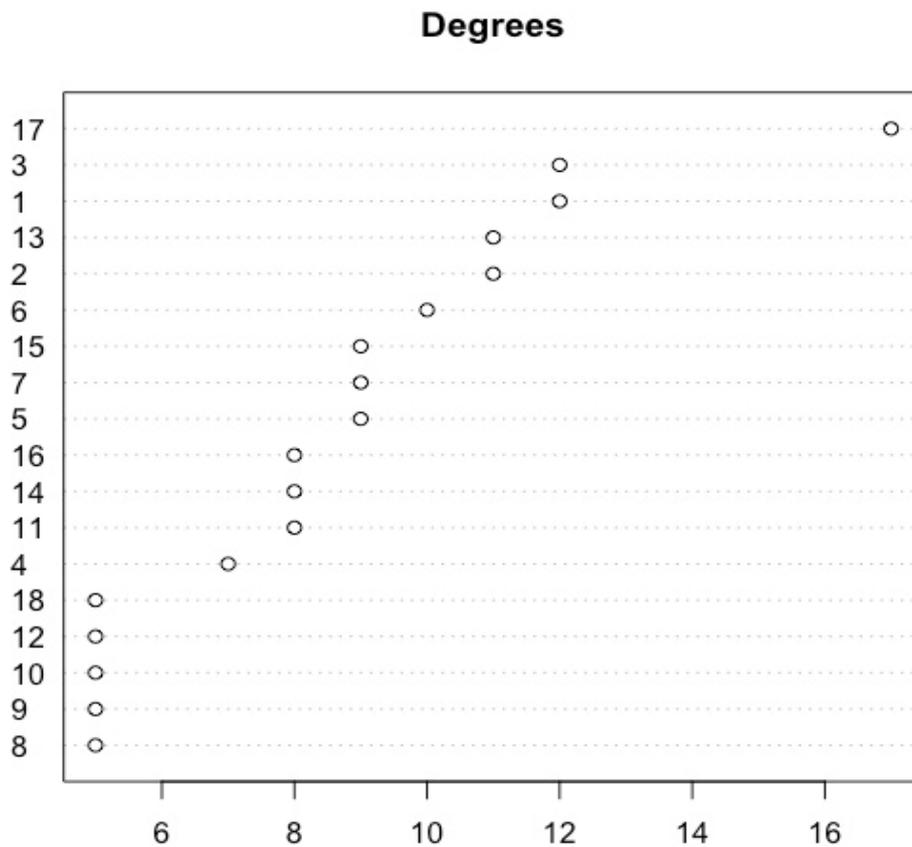
From this relational matrix, we deduce the following non-oriented graph, which allows us to visualize the relations existing between the eighteen Sustainable Development Goals of the Global Action Plan. Each objective is identified by its number, as indicated in section 1 of this work.



The centrality of Goal 17, which explicitly consists in strengthening the means to implement and revitalize the Global Partnership for Sustainable Development, is reflected in this graphic representation. There is also a "nexus" around goals 1, 2, 3 and 6, which is to eliminate hunger and poverty, to allow everyone to live in good health, and to guarantee access to water and to sanitation for all.

#### 4.1. Degree Centrality

A first quantitative approach to the network of SDGs relationships can be based on the number of links between each SDG and the others. Graphically, we obtain the following diagram, where the number of the SDGs is on the ordinate, and the number of links, on the abscissa. In the language of graph theory, the number of links of a vertex is called its degree.



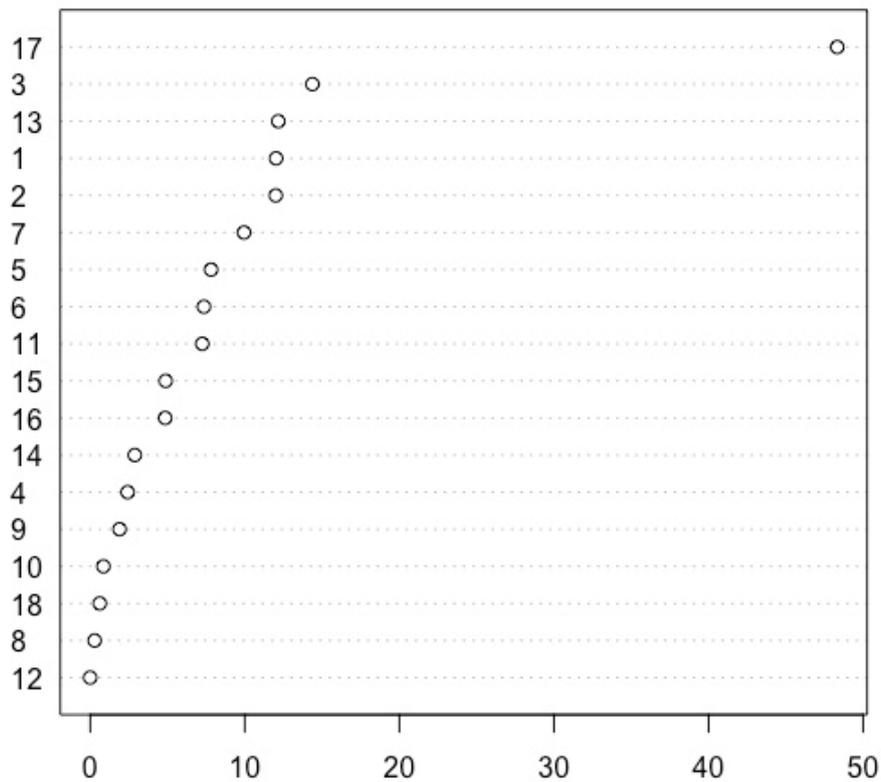
It thus appears that the SDGs most related to the others are: first, SDG 17, as one would expect by its very nature, then SDGs 1 and 3, with 12 links out of 17 possible and the SDGs 2 and 13 with 11 links out of 17 possible. From the point of view of the number of links, SDGs 17, 1, 2, 3 and 13 appear to be the most central.

SDG 17 is: "Strengthening the means to implement and revitalize the Global Partnership for Sustainable Development", SDG 1 aims to "End poverty in all its forms and around the world" and SDG 3 to "Allow everyone to live in good health and promote well-being at all ages".

## 4.2. Betweenness Centrality

Another approach to centrality is based on the notion of betweenness. According to this approach, an SDG is all the more central in that it enables to connect others.

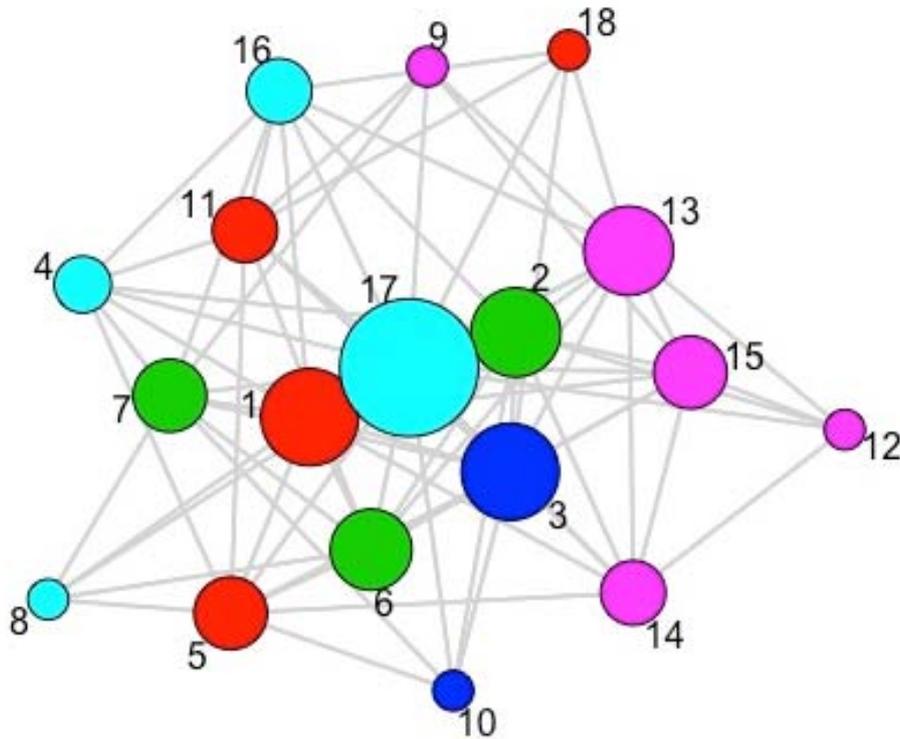
### Betweenness



The diagram shows that, from this point of view, the most central SDGs are SDGs 17, 3, 13, 1 and 2. We thus find again the goals highlighted by the degree centrality, but the objectives 3 and 13 appear to be more cross-cutting than 1 and 2. Goal 3 is to “enable all to live in good health and promote well-being at all ages” and goal 13, to “take urgent action to combat climate change and its impacts”.

### 4.3. Categories of SDGs

A typology of the various SDGs, obtained by using tools from Statistical Network Theory, is summarized by the graph below, where each color indicates a different category of SDGs. Each category corresponds to a particular positioning in the network of relations between SDGs. The size of the disks identifying the SDGs is proportional to their degree (number of links).



There are five categories of SDGs. The first includes SDGs 17, 16, 4 and 8 and brings together education, economics and the socio-political dimension, which constitute the fundamental foundation of sustainable development, without which it cannot be envisaged.

The second category includes SDGs 9, 12, 13, 14, 15. The goals are to build a resilient infrastructure, to promote sustainable industrialization that benefits to all and encourage innovation, to establish sustainable consumption and production, to take urgent measures to combat climate change and its impacts, to conserve and sustainably exploit oceans, seas and marine resources and to preserve and restore terrestrial ecosystems by ensuring exploiting them in a sustainable way. This is the heart of Sustainable Development in its various aspects.

The third category includes SDGs 2, 6, and 7. They are concerning access to water, access to energy, the elimination of hunger and ensuring food security. These are the most fundamental challenges of Sustainable Development, which call for the most urgent action.

The fourth category includes SDGs 3 and 10. They are respectively concerned by "enabling all to live in good health and promoting well-being at all ages" and "reducing inequalities in countries and from one country to another one. " These goals are obviously linked, and mix economic and social dimensions.

Finally, the fifth category includes Goals 1, 5, 11 and 18. The concerns are the elimination of poverty, gender equality, accessibility and security of cities and human settlements, and the welcoming of migrants.

## 5. General conclusion

The interest of these graphic figures, in the context of Education for Sustainable Development, lies in the fact that they highlight the groupings of Sustainable Development Goals that constitute all the action poles to urgently implement, as well as the frameworks in which to register them for a greater effectiveness, and the bases on which to lean in order to support all the efforts and to give them the opportunity to deploy themselves. Finally, these graphs reveal all the architecture underlying the construction of Agenda 2020 then 2030, and the means to implement it, because it is indeed a great building with its basis, the various elements to construct according to the order of priorities, and the materials to be used to make the whole construction a resilient, stable and sustainable one.

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