

How Companies Can Apply Quality to Address Planet Earth Concerns

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1. Introduction

The International Academy for Quality (IAQ) expresses its mission as the 'IAQ Way: Quality for Humanity.' It reads as follows: "By our mutual contributions, IAQ advances quality throughout the world for the benefit of humanity, pursuing excellence through professionalism based on uncompromising fundamental values of respect for the individual, integrity in thought and action, and compassion for all living beings".

Both the wellbeing of humanity and compassion for all living beings depend on safeguarding the unique ecosystem that we call planet Earth. If there are concerns about the state of the planet, it is in line with the mission of IAQ to use the power of quality to help improve the situation.

In this article we will first look at the current threats to the planet and the actions and activities that are causing these threats. Then we will show how quality in general can play a crucial role in increasing the sustainability of the planet. But meaningful contributions do not come from general statements, they come from actions taken in the real world by organizations and individuals. We will present a model that proposes three pillars of sustainability – financial, environmental and social – and show that every business organization can contribute to sustainability. We will link the sustainability related efforts to quality management principles, systems, methods and tools. In later publications we will go into more details on each aspect.

2. Planet Earth Concerns

There are many models describing phenomena that have a devastating effect on the state of our ecosystem. We identify five major phenomena:

- 2.1. **Bio-extinction:** The present period in our planet probably marks its sixth mass extinction of species – this time caused by humans. It is difficult to estimate the precise rate of extinction of species but all research points to a very rapid decline in species and in the number of individuals within various species. A decline in the population of any species is a precursor to its extinction.
- 2.2. **Global Warming:** The evidence of global warming and of the influence of human activity on global warming is ever increasing and beyond reasonable doubt. The world's 20 warmest years recorded have all occurred in the last 22 years, with the last 4 years being the warmest. This leads to more extreme weather (floods, draught periods, stronger hurricanes) and devastation of natural habitat, one visible harm being the degradation of coral reefs.
- 2.3. **Lifestyle Diseases:** Today a greater proportion than ever of world population suffers from heart disease, diabetes, cancer, allergies and obesity.
 - Some 15 million new cancer cases and 8 million deaths are reported each year (Cancer Research, UK).
 - Some 370 million people are diabetic.

- Seventeen million die of heart disease.
 - ‘Allergies ... affect as many as 30 percent of adults and 40 percent of children,’ at least in U.S.A, says the Asthma and Allergy Foundation of America.
 - Thirteen percent of adults over eighteen were obese in 2014 (World Health Organization ((WHO)).
 - In addition to this mental or neurological disorders affect around 450 million currently (WHO).
- 2.4. **Pollution of air, land and water bodies:** Air pollution in large cities like Beijing and Delhi make the headlines episodically. There are automobile piles, refrigerator mountains and tire hills. Landfills not only cost money, but they can also be hazardous. The wastes we throw away carry heavy metals like chromium, lead, antimony, cadmium and zinc which are near-impossible to recover and diverse toxic chemicals that may be carcinogenic, teratogenic or mutagenic. Incineration of plastics produces dioxins. Sewage as well as medical waste and plastics seem to find their way to bodies of water. “Recent studies have found hormones, endocrine disruptors, and other dangerous compounds in bodies of water that receive ‘treated’ sewage effluents.” (Braungart & McDonough, 2008)
- 2.5. **Resource Scarcity for the Future:** Business and farming requirements have caused the worldwide depletion of forests, accessible fresh water, fossil fuels, minerals and metals, topsoil, and marine life, while also degrading arable land through salinization and acidification. These are but a few of the ways in which Diamond (2006) has argued that collapsing societies have ‘undermined themselves.’ Depletion of the Earth’s capital is not financially calculated by economists, nor, in most cases, paid for by industry.

3. Actions and Activities Causing the Environmental Phenomena

The above-mentioned phenomena are the symptoms, the results of human activities. In order to do something about these phenomena these human activities will need to change, or the negative effects associated with these activities will need to be reduced and preferably eliminated.

3.1 Release of Greenhouse Gases (GHG): Besides irrational incentives, the continued burning of fossil fuels is a direct result of allowing withdrawals from the Earth’s ‘capital’ at no charge to companies. Thus, moving away from fossil fuels as an energy source has been discouraged, except when local air pollution concerns have become pressing. Carbon-dioxide (CO₂) in our atmosphere is at about 400 ppm and rising. Roughly one-third of the CO₂ that humans have so far pumped into the air has been absorbed by the oceans, which are now progressively less alkaline.

3.2 Discharge of Effluents: Rivers and lakes have been contaminated by industrial effluents such as mercury, lead, nitrates, phosphates, sulphur, oils and petrochemicals. Oceans, according to a 2017 report of Sustainable Development Solutions Network (SDSN), ‘are polluted ... and contaminated with plastics.’ Soil is contaminated with pesticides and heavy metals in addition to becoming salinized and acidified. Chemicals used or discarded may migrate through earth and water to vulnerable parts of the ecosystem – sometimes with delays of years.

3.3 Use of Non-renewable Resources: Mineral and metal ores (and of course fossil fuels) are non-renewable and are apt to be exhausted in the near-term – within the current century or within a few centuries in many cases. Fresh water is a case by itself. While its stocks do not run down, water has been shifting to less accessible sites on Earth; and fossil groundwater is not

replaceable. Gross Domestic Product (GDP) calculations do not subtract the ‘cost’ of Earth’s assets depleted.

3.4 Depletion of Renewable Resources: The use of soil, water, forest or fish can be sustainable when their use is ‘no greater than the rate of regeneration of its source’ (Meadows *et al*, 2004). Topsoil, rain forests, some marine life, and genetic diversity are already at ‘crisis’ stage. Renewable substitutes for non-renewable resources will need to be consumed slower than the regenerative capacity of the biosphere. A report of International Union for Conservation (IUCN) (1991) warns against exceeding the ‘carrying capacity’ of the Earth, with respect to using up resources.

3.5 Chemicalization: Over 100,000 chemicals (Chemical Abstracts Service) are produced, and toxicities of most are unknown. Just about anything we use - food, toiletries and cosmetics - has manufactured chemicals in it. Though even permitted chemicals can be hazardous; scandals about chemicals in food have periodically set off alarms across the world. Hormones and antibiotics fed to animals find their way into the food chain. Products like paints may off-gas chemicals from walls. Many industrial chemicals must be regarded as potential hazards of high magnitude.

3.6 Pile-up of Wastes: Waste occurs in mining and manufacturing, in distribution, in consumption and in scrapping of used products. Municipal solid waste (MSW) generation is estimated by World Bank at 1.3 billion tonnes per year. We also have chemical, nuclear, synthetic and medical wastes. Toxic wastes including chemicals or radioactive substances are the number one threat. Close on the heels is waste that is not biodegradable, such as plastics, which literally remain forever, and composites.

3.7 Radiation: Human activity has contributed to increased ultraviolet radiation through ozone holes. This problem has been contained through international cooperation on Chlorofluorocarbons (CFC), and the development of substitutes. Nuclear radiation is far from controlled though, as periodic accidents remind us.

Together, these activities have created the five major phenomena described earlier. In Table 1 we show how the activities are linked to the planet Earth concerns.

	Concerns	Bio-extinction	Climate warming	Diseases	Pollution	Scarcity in future
Activities						
Greenhouse Gases		⊕	⊕	Δ		
Effluents		○		⊕	⊕	Δ
Non-renewables			Δ		○	⊕
Renewables		○		Δ	○	⊕
Chemicalization		⊕	Δ	⊕	Δ	
Wastes			Δ	○	⊕	
Radiation		Δ	Δ	○		

⊕ = High influence, ○ = Medium influence, Δ = Small influence

Table 1: Overview of five major phenomena linked to planet Earth concerns

4. **Involving Businesses in the Sustainability Movement**

There is clearly a growing concern about the phenomena described above and their injurious effects on our ecosystem. The United Nations (UN), national governments, cities, companies, Non-Governmental Organizations (NGO) and concerned citizens all warn of the problems that we will be faced with if we continue in a business-as-usual fashion.

In 1987, the UN-appointed Brundtland Commission defined sustainable development as 'development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs'.

At a global level, the UN has been active in developing sustainability models and setting targets. In 2015, 17 Sustainable Development Goals (SDG), further detailed into 169 targets, were announced with a 2030 deadline. While all these goals are in some ways connected to business operations, some are more directly connected than others. These include Goal 7 (Affordable and clean energy), Goal 8 (Decent work and economic growth), Goal 12 (Responsible consumption and production), and Goal 13 (Climate action). There is also the UN Global Compact (UNGC), a voluntary initiative for businesses, based on Chief Executive Officer (CEO) commitments to implement universal sustainability principles. Its current membership numbers 10,000 businesses from 162 countries. UNGC enshrines 10 principles for businesses, of which three directly impact the environment. Principle 7 urges a precautionary approach to environmental challenges, principle 8 commends initiatives to promote greater environmental responsibility, and principle 9 advises the development and diffusion of environmentally friendly technologies. The ten principles may be helpful for companies to fulfil their corporate social responsibility in a manner that is well integrated with their business activities and objectives.

In cooperation with other agencies UNGC has also launched 'Science Based Climate Targets' that companies can align with to build a sustainable economy. About 500 companies have already declared their targets. Science-based targets bring in the voices, not only of corporate leaders, but of investors too. Many organizations such as the Stockholm Resilience Centre (SRC), International Union for Conservation of Nature (IUCN), World Wildlife Fund (WWF), World Resources Institute (WRI), Carbon Disclosure Project (CDP) and others are also involved in projects of relevance to businesses. Many exciting approaches have evolved in recent times – some interesting ones include Cradle-to-Cradle Design, Regenerative Design, Biomimicry, and Circular Economy.

The contributions of these organizations and approaches are important and have helped mobilize large numbers of professionals as well as lay persons on addressing planetary concerns holistically. It is valuable work at a macro level. But this paper primarily addresses the business world. Despite all these organizations and the availability of a long list of interesting publications, in many businesses not even the basic concepts of sustainability are well known. Sustainability is frequently seen as a purely environmental issue and at best, the objective is to not violate environmental laws in order to avoid fines or negative publicity.

The reasons for this situation are threefold:

- Organizations active in sustainability talk in terms that are not always understood within the business community. They also tend to focus on systems and methods that require specialized

resources and knowledge. This is a problem for all companies but creates an even bigger obstacle for smaller organizations.

- Companies need to be focused on managing their primary process in order to be cost effective and customer oriented. As a result, the myriad of interesting publications available on sustainability often do not reach businesses. Companies do not have the time, nor the means to read these publications. As a result, they are not part of the sustainability movement.
- Finally, most of the publications are focussing on a macro level, at a planetary scale. This makes it difficult for companies to relate to these ideas. It makes their potential contributions look almost meaningless. Moreover, and this is where change is most needed, there is a lack of an action-oriented approach in the sustainability community.

The consequence is that a large potential for sustainable development is not tapped into. If we are to succeed in the SDG effort, we will need every possible stakeholder to get involved and contribute. The best way to do this is to integrate the sustainability policy and activity within a function already existing in most companies: quality management. Quality can create breakthroughs at the micro level. Organizations can become more sustainable by taking actions that are based on quality fundamentals and using quality tools, while staying viable.

5. Quality and Sustainability: Two Sides of the Same Coin

Quality management has a long history of being able to cut wastes and produce better designs faster and thus win customers, while simultaneously cutting costs. Quality comes with an array of management mechanisms such as Policy Management or *Hoshin Kanri*, which enable organizations to plan and execute their strategies through the combined efforts of its functions; cross-functional management that brings horizontal linkages in managing quality, cost and delivery; and daily management that helps maintain the gains and clarifies roles. It has powerful ways to engage everyone, particularly those in the frontline, in making improvements constantly. Under this umbrella, everyone is encouraged to set challenging targets and use powerful problem-solving methodologies, using a multitude of techniques with skill. Quality is a proven way to transform a company in every dimension.

Furthermore, the meaning of quality itself is expanding. Societal quality is being assimilated into the mainstream and not left as something peripheral. Quality is now engaged in not only satisfying customer needs, but also societal needs and the needs of future generations – at a minimum not causing harm. Changes to criteria of quality awards testify to this change in thinking.

The scope or domain of quality can be visualized in a nested design as in Figure 1.

- Q_D = Quality of Design
- Q_P = Quality of Production
- Q_V = Quality of Vendor items
- Q_C = Quality of Customer experience
- Q_S = Societal Quality

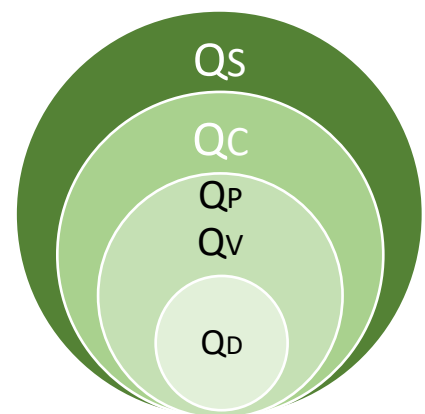


Figure 1: Domain of quality management

Quality may now be defined as: *fulfil stated, implied and latent requirements of customers while causing no harm*. And the role of quality management can be seen as enabling, through quality, humanity to thrive in a healthy planet.

The practice of the well-tested and proven methods of quality management seems the most assured way to integrate the concerns regarding the Earth with the objectives of financial success as well as societal acceptance of businesses. This is explained further in the next section.

6. The Quality – Sustainability Matrix: A Framework for Action

We will refer to three elements that are the building blocks or pillars of sustainable development: financial, environmental and social sustainability. This is similar to the suggestion of the UN Global Compact that businesses formulate visions that encompass economic prosperity, environmental quality and social equity. In 1997, John Elkington coined the terms Profit, Planet and People, described by him as economic prosperity, environmental quality and social justice. Thus, there is considerable validity to the three-pillar model used in this paper.

However, not all organizations are at the same starting level in their sustainability efforts. Hence, the Sustainability-Quality matrix presented here offers a graduated progression from a zero starting point. In other words, the model suits companies at any level, even one that has not been engaged in sustainability activities and may not currently be interested in the topic. The contention here is not that business leaders are unconcerned about harm to planet or society, but that the commitment of those business leaders to take bold steps forward may be tempered by the prospect of inequitable competition from those who may have less stringent demands on sustainability. Therefore, this model begins with carrying out sustainability activities that can *improve* profitability.

As a starting point we will assume that several basic aspects of social sustainability (non-discrimination, child labour, ...) are legal requirements that a company must follow in order to be allowed to operate. Note that this is not necessarily the case everywhere. We consider it a task for all governments to create this minimum starting condition.

We see three steps in the development of sustainability within an organization and these are indicated in a triple A format: Awareness, Adoption and Achievement. In Table 2 the overall matrix is presented, linking the status of the organization to the three aspects of sustainability and to the appropriate quality methods. In the following paragraphs we will give more detailed information on each of these phases.

Sustainability Status	Financial sustainability	Environmental sustainability	Social sustainability	Quality methods and tools
AWARENESS Operational sustainability Remove false contradiction between sustainability and profitability	Focal point and driving force	Start to reduce harm	Fulfil local legal requirements	Add environmental goals, savings from improvements, 7 tools PDCA, basic lean principles, DMAIC problem solving
ADOPTION Strategic sustainability Sustainability incorporated in mission, vision and objectives	Added benefit	Driving force with focus on reducing harm	Expand on legal requirements using SDGs	Integrate systems fully, expand companywide, add DFSS, add TRIZ, expand Lean and TPM
ACHIEVEMENT Holistic sustainability Integrated sustainability as the driver and primary company value	Logical consequence	Focus on improving the global ecosystem	SDGs as basis for full social responsibility	SDGs as basis for targets, ecosystem improvement, empowerment through values

Table 2: Overview of sustainability status and quality tools

6.1 Awareness – Operational Sustainability

Introducing sustainability to a chief executive is best done through financial sustainability. In fact, it is possible that he or she is not aware of the fact that there is a financial component to sustainability. In addition, this is the perfect link to quality management as a driver for sustainability. Over the years, quality has made major contributions simultaneously to customer satisfaction and process efficiency, two aspects that have added to the profitability of the organization.

Note that the notion that quality and efficiency go together was not easily accepted in business. On the contrary, for a very long time they were seen as opposites. It was only in the seventies and eighties that it gradually became clear that quality could help an organization to become more profitable. Today we are faced once again with a false contradiction, this time between profitability and sustainability.

Many quality improvement projects have added not only to the financial sustainability, but also to the environmental sustainability of an organization. But this often passes unnoticed. Quality professionals can point out how their improvement projects have a positive effect on the sustainable development of the organization through reduced material use, energy savings, lower water consumption, and so on. Or, turning it the other way around, how being more environmentally sustainable in our operations brings financial benefits. This is the best way to show that environmental care is not a cost, but an opportunity for added profit. Our environmental target is to reduce the harm that the activities of the company have on the environment.

Once senior management sees the positive financial implications of environmental sustainability, the entire organization can be involved in the first steps towards a more sustainable organization. In this stage we are focusing on trying to run the current infrastructure in a more sustainable way. Operational sustainability can open possibilities for a more strategic approach later. It shows the organization that quality methods and tools are equally effective in improving sustainability as in improving efficiency. This means that the efforts can be combined within the existing structure.

Evolutions in legislation and in costs associated with non-sustainable behaviour will make it more important to work on sustainability improvement projects. Already some countries have introduced taxes on CO₂ emissions. We are also witnessing the beginnings of environment-related taxation. The cost of basic necessities for a company like energy and water are rising at a much higher pace than overall costs. So, any activity leading to a reduction in material and energy consumption is not only saving money today, but it is avoiding much higher costs in the future.

Here are some examples of general actions that can be taken by quality:

- Management system
 - Develop an integrated set of objectives that include environmental objectives in addition to existing quality and operational objectives.
 - Build environmental aspects into existing quality procedures and instructions.
 - If a measurement system exists to compute cost of quality, create a separate entry for savings from environmental improvements.
- Process improvement
 - Evaluate the sustainability factor in each improvement action.
 - Start improvement projects specifically directed at environmental improvements.
 - Apply the 7 basic tools in a Plan-Do-Check-Act (PDCA) approach.
 - Implement lean principles and methods that can support the sustainability efforts, as we are trying to eliminate all kinds of waste, including Total Preventive Maintenance (TPM).

6.2 Adoption – Strategic Sustainability

In the next maturity level, the organization is ready to take up sustainability as an important factor of the overall strategy. There is no doubt within the organization that sustainability is a factor adding to the long-term success of the organization and that sustainability strengthens its financial situation. This means that it will become part of the mission and vision statements of the organization and included in decisions on investments.

Now we are looking not only at what we currently do but at how we need to function in the future. For most companies this will be a very lengthy path of continual improvement of their sustainability related activities. Again, there is a clear analogy with the way quality management expanded its reach. The first improvements were made in the operational area of organizations, the area where lack of quality and its effects are most visible. It is also an area where actions are corrective: we have a non-quality situation and want to remove the cost and burden it creates. Soon it became clear that the best way to work on quality is the preventive way, using a design approach. This was the point when engineering functions and other activities got more involved in the quality movement. It is the start of Total Quality Management (TQM), with the emphasis on the T of Total.

Financial sustainability is a given in this phase and the focal point is on environmental sustainability with the prime target of reducing harm now and in the future. As far as social responsibility goes, the company looks beyond the legal requirements. The SDGs or the UNGCs can be used as a source of inspiration for targets and actions. A good starting point would be to begin projects involving the local community.

The quality management tools and methods described above in the Awareness phase will obviously still be valid in the Adoption phase but they can be adapted and expanded with new methods. Most of these are linked to the preventive aspect of this phase. We will again put them in the two categories applied above.

- Management system
 - Include sustainability in mission and vision statements and make an integrated set of environmental objectives the central point of company targets. These can be in line with SDGs on the topic.
 - Develop a fully integrated management system containing quality, environment, safety and social responsibility.
 - Ensure all departments, functions, or divisions are involved in the sustainability action. Give specific attention to design and development of new products and processes.
 - Develop a Life-cycle Cost system, so businesses are not only looking at reducing current cost problems (corrective) but also future total cost (preventive).
- Process improvement
 - Expand improvement actions beyond the operations. Take a TQM approach to sustainability.
 - Use design and development methods that are preventive like Design for Six Sigma (DFSS).
 - Use tools that are preventive such as Quality Function Deployment and Failure Mode and Effects Analysis.
 - Apply tools such as Theory of Inventive Problem Solving (TRIZ) in new product development, forcing businesses to think beyond the current product solution for a customer expectation. Ideally developing a new business that does not require a product at all but still satisfies the functional needs of the customer.
 - Implement lean principles beyond operations.
 - Add mechanisms such as *hoshin kanri* and cross-functional management to operationalize strategy.

6.3 Achievement – Holistic Sustainability

Most organizations and especially Small and Medium-sized Enterprises (SME) will see the full implementation of the adoption phase as their maximum attainable contribution to sustainability. With the achievement phase, we want to take this one step further. The most important aspect of the achievement phase is that “reducing harm” is no longer seen as good enough. Even if the most advanced companies in the most advanced economies bring their harm back to zero, this might not be enough to safeguard and improve our global ecosystem for the next generations. As a thought experiment for this phase, what if we could design a city transport system that cleans the outside air while it is transporting passengers?

In the adoption level we focused on expanding the sustainability activities over the entire company. In the achievement phase we also need to expand our thinking to all aspects of planet Earth concerns and to various types of harm. Generally speaking, we should be looking at all possible impacts of our products and services on planet Earth and we should use preventive and precautionary approaches.

As an example, not that long ago micro-plastics were added to toothpaste and cosmetics. This happened at a moment when the heavy plastic pollution of the oceans was well-known and that the presence of micro-plastic in many sea animals had been observed over and over again. It is beyond comprehension that a company designs a new product that is bound to end up in water (toothpaste!) and that contains micro-plastics. A holistic, sustainable-thinking company would never bring a product like that to market. After protests the micro-plastics were taken out, but it is a clear example of a total lack of preventive thinking regarding harm.

Along the same lines business would aim for zero waste and end-of-life, only using chemicals that have been proven to be safe in the long term, using zero carbon energy, replacing products by

services avoiding the need for materials, or employing cradle-to-cradle or regenerative designs.

This constitutes a clear shift; our main objective now becomes to improve the overall ecosystem and to use the SDGs as the guiding document for all of our targets. Our targets still include economic growth and financial sustainability but expand much wider on environment and social sustainability. It requires fully integrated sustainability thinking.

The importance of sustainability as a prime value for the organization cannot be overrated. In a company in the achievement state it would be totally impossible that a company could perpetrate a massive fraud and repeatedly lie regarding emissions to investors in connection with a scandal such as 'Diesel-gate'. No one in the company would be willing to create software (or anything else for that matter) that violates the main value of the organization so clearly. In fact, no manager would even think about asking people to develop software like that. 'Diesel-gate' is a sad example of how far we still are from sustainability thinking and adherence to values.

This is a situation where we are looking at a different set of methods and tools. We go beyond the technical/operational issues and even beyond strategic elements to a much more value driven organization. The techniques used to reduce harm, as indicated in the adoption phase, can also be used for developing products and services that improve the environment. At a system level we go beyond mission and vision and focus on values.

For any company it will be vital to take into account changes that are bound to happen in the general conditions in which an organization will operate. These will have a huge impact on the success or failure of the business in the future. For instance, a recent Intergovernmental Panel on Climate Change (IPCC) report shows the expected differences in global impact at 1.5 °C and 2 °C warming. The difference in impact is significantly worse with the increase and the current view is that with the actions that are being taken we will not be able to stay beneath 2°C warming, so more must be done. Both the International Monetary Fund (IMF) and the Organisation for Economic Co-operation and Development (OECD) have made estimates that 20 – 25% of the global economy could be spent on fighting the consequences of global warming. It is almost inevitable that world leaders will impose very stringent measures in order to counter-act the problem. Companies that think about potential consequences of these measures on their business today, will be best prepared to flourish in this changed environment. They will have taken action ahead of time and will not be taken by surprise.

Quality management will focus on high level strategy. Breaking them up into the two categories we see the following elements emerging.

- Management system
 - The strategy development process must take into account the evolutions described above.
 - Holistic sustainability is the fundamental company value and the starting point for mission and vision statements and company targets.
 - In setting targets, all SDGs are evaluated and targets must aim at ecosystem improvement and fit in a total Corporate Social Responsibility system.
- Process Improvement
 - Every employee has the power and obligation to point out activities or situations that go against sustainability, just as he or she points out out-of-control conditions leading to quality problems in a TQM company.
 - All aspects of harm are considered in the design and production processes.
 - Preventive thinking and the precautionary thinking principles are the foundations for all activities.

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- Improvement projects aim to create a better environment and a better society.

7. Conclusion

Planet Earth concerns are pressing and require affirmative action. To achieve the SDGs by 2030 or to reach the climate targets set at the Paris Agreement, the contribution of large parts of society will be needed. Information and mobilization are absolute requirements, but to achieve these goals a practical method for action will be needed. In this article we have shown that sound and proven quality management systems and tools can be the driving force for this engagement. Any organization can take action as part of its current status and financial possibilities.

Afternote:

This White Paper has been prepared by Academicians Narayanan Ramanathan and Willy Vandenbrande, Chair and Co-chair respectively of the Quality in Planet Earth Concerns Think Tank (QiPECTT) of the International Academy for Quality (IAQ). The Paper has been adopted by QiPECTT.

The White Paper is the amalgamation and editing of several presentations made by Ramanathan and Willy at various conferences, three papers, and additional materials, to form a single, unified view of the topic. The White Paper has been further edited by Elizabeth Keim, President, IAQ.

The three papers referred to are:

Ramanathan, Narayanan, *Quality-based Management for Future-ready Corporations Serving Society and Planet*, April 2019, Journal of Total Quality Management and Business Excellence

Vandenbrande, Willy, *Quality for a Sustainable Future*, March 2019, Journal of Total Quality Management and Business Excellence

Vandenbrande, Willy, *The Role of Quality Management in Ensuring a Sustainable Planet*, January 2020, The Journal for Quality and Participation

The White Paper is intended for general reading of IAQ members and other interested persons.