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Sustainability in the value proposition of Science Parks and Areas of Innovation: Is the future already happening?

Parallel Session 5
"Key elements of next generation STPs and AOIs"

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Sustainability and climate action in the value proposition of Science Parks and Areas of Innovation: is the future already happening?

1. Introduction

Areas of innovation are defined as *"places designed and curated to attract entrepreneurial-minded people, skilled talent, knowledge-intensive businesses and investments, by developing and combing a set of infrastructural, institutional, scientific, technological, educational and social assets, together with value added service, thus enhancing sustainable economic development and prosperity with and for the community." (*NIKINA; PIQUÉ, 2016)

Additionally, a science park is "an organization managed by specialized professionals, whose main purpose is to increase the wealth of its community by promoting the culture of innovation and the competitiveness of its associated businesses and knowledge-based institutions. To enable these goals to be met, a Science Park stimulates and manages the flow of knowledge and technology amongst universities, R&D institutions, companies and markets; it facilitates the creation and growth of innovation-based companies through incubation and spin-off processes; and provides other value-added services together with high quality space and facilities." (United Nations)

As areas with high demand on creativity and networking, the value proposition of STP/AOIs (Science Parks and Areas of Innovation) follows the recent trend described in the Location Theory, in which soft factors such as business environment and availability of intellectual capital are highly significant in contraposition to traditional hard factors, like location costs and proximity to consumer market (MURPHY; REDMOND, 2008).

This evolution can be observed, for instance, in the **"**The Linköping Declaration", the resulting document of the 2014 International Symposium "The Value of Science Parks", held in Sweden. The document states that the critical success factors for future science parks are Business Development Support, Attractiveness, Networking, Open Innovation, Smart Specialization and Internationalization.

However, any trend on innovation environments, as well as in any other human activity, takes place in a broader context, within planetary boundaries. In this sense, sustainable development issues, including climate change, also applies to STP/AOIs as a necessary condition for future progress, and therefore, environmental matters can be treated as both a threat or an opportunity, but never ignored.

2. Method, results and discussion

2.1. Method

To start answering these questions, the present research developed a framework to assess the potential contribution of such environments to the overall sustainability/climate debate (**Table 1**. And **Figure 1**, **Annex 1**). The proposed is based on literature review and interviews with park managers. It has three layers of complexity in which the STP/AOIs can have initiatives related to sustainability/climate change, including (1) reducing its own impacts, (2), new technologies and outreach and (3) local development, implying that the effort and necessary coordination increases. The list of park visits and participants are included in **Annex 2. Acknowledgements.**

Considering this framework, a survey with questions for each category was developed and, with the collaboration of IASP, submitted to its members worldwide. Finally, the study includes insights of some members of IASP`s Board of Directors.

2.1.1. Reduction of its own impacts

The main reference for the category **(1) reduction of its own impacts** is the Federal Government of Germany publication on climate concepts, specifically the section referring to universities of applied sciences (BMUB, 2016). It encompasses the property itself, mobility, renewable energy, heat utilization, green IT, waste, and procurement. To this initial list, themes that emerged in the interviews with park managers were added, such as water harvest and reuse, green areas, adaptation and greenhouse gas (GHG) compensation.

2.1.2. New technologies and outreach

The main reference for the topic **(2) New technologies and outreach** is the work of NIDUMOLU et al. (2009) on the relevance of using sustainability as a driver of innovation, to which other subjects were added. Thus, the topic encompasses: resident companies (tenants) in the cleantech sector and/or with actual low carbon product/services; host of conferences, seminars and workshops related to sustainability; use of website, social media, and other channels to raise awareness on sustainability and climate change issues and solutions; visitors center to promote cleantech with regular visits from schools, foreign delegations, and general public.

2.1.3. Local development

The main reference for the topic **(3) Local development** is the work of WALLNER et al. (1996), with the basic assumption that the development towards sustainability can be introduced starting from sustainable 'islands', in which an island is an area where sustainability is reached at a local or regional level. In addition, Porter (1998) refers to the benefits of an economy based on the ‘cluster’ concept. To this list, the park managers added the impotance of being active in the policy-making. Therefore, the category includes: permanent groups, labs or institutes for sustainability/climate change; leadership or participation in a green city development, cleantech/low carbon cluster and/or regional climate adaption plan.

2.2. Results

The survey results, held with collaboration of the International Association of Science Parks (IASP), allowed assessing the overall perspective of approximately 60 park managers in 30 countries on key issues such as the role of STP/AOI on sustainable development and perceived enablers and barriers for further action.

The survey respondents (sample or universe of analysis) included a substantial share (56 out of 276, or 20%) of IASP full members, meaning only STPs and AOIs fully operational. Mostly located in Europe (50%), but also Asia Pacific (16%), West Asia and North Africa (13%), North America (9 %), Latin America (9%) and Africa (4%) (Figure 2, Table 4, Annex 3).

2.2.1. Role, Enablers and Barriers

Regarding the role in the sustainable development/low carbon economy (Figure 3, Annex 3), only 7% believe it is restricted to traditional growth (business as usual), and to 16% it is only to comply with government environmental policy/regulation. On the other hand, 98% agree their role is to incubate cleantech and low carbon startups and Small and Medium Enterprises (SMEs), while 95% understand they should develop green projects (eg. energy efficiency, green mobility, etc.).

When it comes to enablers for further action (Figure 4, Annex 3), the STP/AOIs responded positively as being a driver of innovation (91%) and as a business opportunity (89%) while not as much to a sustainability/climate award specific to STP/AOIs (63%) and environmental pressure of stakeholders (eg. NGOs, media, general public, etc.) (70%).

Regarding barriers for further action (Figure 5, Annex 3), the lack of budget was identified as the main reason for not advancing green initiatives (86%) and environmental pressure of stakeholders is equally understood as an enabler and a barrier (70%). About the perceived value of having such a sustainability orientation, the respondents believe it is mostly recognized by the investors/shareholders (59%), followed by the tenants/clients (45%) and park managers (34%), respectively.

2.2.2. Management Practices

Considering the sustainability policies/forms of management (Figure 6, Annex 3), the STP/AOIs have, mostly, an informal sustainability policy and related projects (61%), while others have additionally a formal (written) Sustainability Policy (39%). In some cases, this policy is followed by a specific plan with targets and indicators (29%), and it counts with a designated person or department in charge of this sustainability management (41%).

Regarding standards used to guide these Sustainability Plans, most of the respondents mentioned none (73%), followed by Global Compact (13%), the SDG - Sustainable Development Goals (9%) and others (5%). As examples of other standards there were environmental models at national level, customized standards (own STP/AOI ambitions) and ISO 14001. Specifically on climate change (Figure X), these plans involve mitigation (43%), adaptation (36%), both (34%) and none (55%). As an example, the Technoparc Montreal and the Utrecht Science Park plan to develop their sustainability police and plan next year.

On reporting standards to disclose the sustainability performance, only one case (2%) - the Central Taiwan Science Park (CTSP) - declared to follow the Global Reporting Initiative guidelines (Year 2015 – G4 version). Among the park highlights: “CTSP has been devoted to the economic development, social harmony and environmental protection (...) Currently, a total of seven buildings at CTSP were awarded with the Highest Ranking of EEWH - Green Building Label / Diamond Grade, three were granted Bronze Grade, eleven were granted Certified Grade, and one was granted the Green Factory from the Ministry of Economic Affairs. (…) Also, the cumulative amount of water saved in 2015 reached 1,038,279 metric tons, while electricity, also in 2015, reached 25,505 thousand kWh, showing our efforts of being environmentally friendly. (…) Under the objective of sustainable management, our belief and philosophy is based on the 'Unity of Production, Living, Ecology and Life', while on the other hand give considerations to environment sustainability and social harmony to actively create a friendly science park for coexistence and co-prosperity.”

2.2.3. Green Initiatives

Considering the sustainability/climate initiatives, the (Figure 8, Annex 3) demonstrates that comparing to the proposed framework of assessment, most of the practices are related to the first layer of complexity: the reduction of the own park/area impacts. For instance, most STP/AOIs replied having cycling paths, shower, and secure parking for bicycles and/or (non)electric bikes available for tenants and users (73%); waste recycling and/or composting (71%); use of virtual conference as an alternative for physical mobility (68%); green procurement practices (eg. buying from local suppliers, preference for low carbon services/products) (66%); public transport (train, bus, etc) options and incentive (66%); and renewable energy resources (eg. solar, wind, geothermal) generated at the STP/AOI (55%).

In contrast, a smaller share of the respondents look for certified green infrastructure - roads, area, etc (eg. LEED, CEQUAAL) (32%) or certified green buildings (eg. LEED, BREEAM) (46%).

Among the highlights of this category, there are:

> **Highlight (1): Umwelt-Campus Birkenfeld (Germany)** – Due to the extensive utilization of sustainable technologies, UCB is the first Zero-Emission Campus in Europe. Energy and heat are supplied by a neighboring biomass combined heat and power station, and the campus also counts with photovoltaic and geothermal energy, so that the final energy output-input balance is positive or close to zero.
>
> **Highlight (2): Johanneberg Science Park (Sweden)** – The headquarters received the Swedish Green Building Council GOLD certification, due to its design that optimizes energy efficiency and indoor health quality. Its several architectonic and technological features lead to an energy consumption < 35 kWh/m^2/year, and the plan is to become carbon neutral. Furthermore, the building is set to serve also as a laboratory, in which future solutions can be tested in cooperation with tenants, suppliers and researchers (e.g. energy-smart solutions, direct current, solar panels, battery banks, microgrids etc.).

In relation to the second layer of complexity - new technologies and outreach - a significant part hosts conferences, seminars, and workshops on sustainability/climate change (66%); use its communication channels (eg. website, social media) to raise awareness on sustainability/climate change (59%); and have resident companies (tenants) in the cleantech sector and/or with actual low carbon product/services (55%). A smaller number report their visitors' center that informs schools/delegations/general public on sustainability/climate change (18%) or the host of external organization/representative related to sustainability/climate change (eg. Climate-KIC) (20%).

Some of the highlights in this category include:

> **Highlight (1): University of Southampton Science Park (UK)** – In a recent collaboration with its award-winning tenant, SEaB Energy installed onsite its compact anaerobic digester (MUCKBUSTER®), which is now delivering electricity from food and garden waste to the Science Park.

Highlight (2): Utrecht Science Park (The Netherlands) – The 2014 international conference 'Smart Sustainable Innovation: The Global Perspective' was a joint initiative of HU University of Applied Sciences Utrecht (HU) and the European association Technology Innovation International (TII). The conference was preceded by a session on sustainable sciences parks, hosted by Utrecht Science Park (USP) and the Utrecht Sustainability Institute (USI), in which 171 participants from 15 different nationalities attended to the congress.

On the third layer of complexity - local development - the STP/AOI replied leadership or participation in a green city development (eg. solar city), cleantech/low carbon cluster and/or regional climate adaption plan (43%); permanent group, lab or institute for sustainability/climate change (32%); active support for (new/existing) government policies on sustainability/climate change (beyond compliance); (30); and any other particular practice related to Circular Economy in local or regional level (eg. exchange of waste heat or byproducts) (13%).

The highlights observed in this category are:

Highlight (1): Gelsenkirchen Science Park (Germany) - The Science Park is the cradle of the Solar City Gelsenkirchen. The Science Park had a crucial participation as both symbol and catalyst of this development, representing a "metamorphosis" from a coal and steel city to a new-energies region. The initiative has inspired and evolved to the RUHR 2022 enterprise, a comprehensive and holistic approach to the climate metropolis.

Highlight (2): Exeter Science Park (UK) – Exeter City Futures (ECF) is a joint endeavor between Exeter City Council, Exeter-based venture capital fund Oxygen House, and a growing list of business and public sector stakeholders. The ECF aims to develop cutting-edge approaches to city improvement through the use of technology and analytics, with the goal of delivering zero congestion and energy independence for Exeter in 10 years. The Science Park is an enthusiastic supporter of the initiative and has a period of exclusivity in place to negotiate the construction and leasing of the ECF headquarters in the Science Park.

2.2.4. Investment

Almost half of the STP/AOI are investing on sustainability/climate related projects (Figure 7, Annex 3 (53%); only a fraction is generating revenues from such projects (24%). When asked about the origin of these resources, it is a mix of own finance (25%) and external funding (18%). Furthermore, regarding the respective source, it was replied private (7%); public (14%) and a mix of them (25%). To exemplify the range and diversity at this category, the Tsinghua University Science Park (TusPark) reported about 1 billion euros in investments; the TEHNOPOL Tallinn Technology Park reports having invested 150.000 euros so far in smart streetlights through the last three years; the Technology Park Ljubljana says their financial plan include yearly investments in "green" activities up to 10.000 euros; and the Parque Tecnológico São Leopoldo (TECNOSINOS) mention 125.000 dollars in total.

3. **Lessons learnt**

Responding to the initial questions, what is the role of sustainability in the value proposition of science parks? And why we do not see more STP/AOIs making the case for corporate sustainability like several businesses? There is at least three main reasons.

First, STP/AOIs in general do not consider their activity as highly impactful in comparison to other industries (e.g. mining or forestry). Although their cumulative effect on energy consumption, transport

emissions and land use change cannot be despised, as it tends to become more important as the emerging economies expand its scientific and industrial infrastructure. However, the initial observations show that, according to park managers, the role of STP/AOIs varies from simply complying with environmental regulations to leadership and advocacy in sustainability affairs.

Second, there is still some actions that may be implemented so that STP/AOIs can advance in their efforts. Broadly named as enablers and barriers, these activities range from tax incentives and specific sustainability awards for STP/AOIs to lack of budget and reduced pressure from stakeholders.

Third, there is simply not enough communication about the practices already in place. Through site visits, interviews, and online communication, it was possible to assess relevant practices in primarily three categories, as briefly presented in the item 2.2.3.

4. Proposals for the future

To mainstream sustainability and climate change in the STP/AOI community it is important to increase the level of exchange and knowledge among the parks, so they learn what are the available options and how the initiatives have been implemented in other contexts and how the managers rate its efficacy.

An effort to integrate these innovation players into networking and policy making could be beneficial not only for the abatement of greenhouse gas emissions and preparedness for climate impacts of the scientific infrastructure but also in the industry and economy due the interconnectivity of the supply chains and the catalytic effect of innovation.

Although the existence of a sustainability/climate award specific for STP/AOIs is not highly supported now, once it becomes recognized and desired among STP/AOIs worldwide it could foster a positive competition among them, with multiplier effect. It could be proposed awards for the different levels and categories presented in the framework of this study. In the same line, a sustainability scale would have to be created with corresponding weights and grades for each aspect with broad expert representativeness taking part in the election process.

Although different in nature, many good examples of sustainability initiatives are also found in business parks worldwide. Thus, a similar study could also apply to their case.

Furthermore, the interest in the sustainability/climate change subject, as verified in the above expected support for the survey for survey means that it could have an annual frequency, aiming for a greater regional representativeness, possibly with the participation of other park associations.

Ultimately, the expectation is that this research will not only advance the discussions on sustainability in STP/AOIs but also inspire and guide parks and policy makers in many countries for further action.

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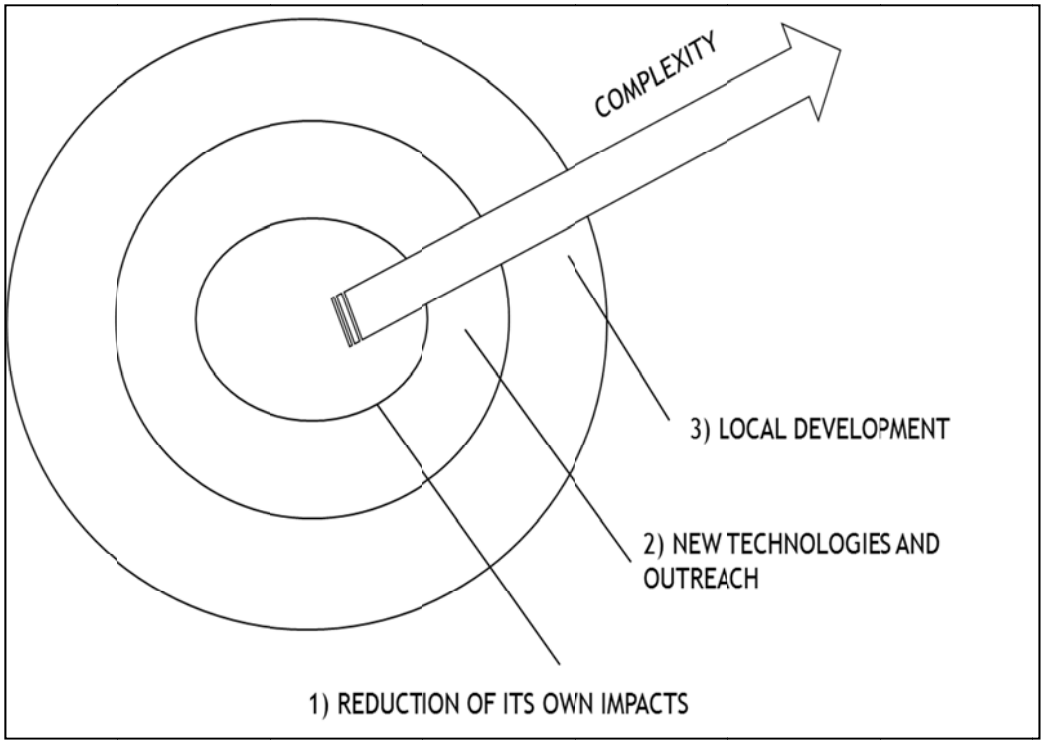
ANNEXES

Annex1. Framework of contribution of STP/AOI on sustainability/climate

Table 1.Categories of contribution of STP/AOI on sustainability/climate

1. **Reduction of its own impacts**
1.1. Own property
1.2. Mobility
1.3. Renewable energy
1.4. Heat utilization
Green IT
Waste
Procurement
1.8. Water harvest and reuse
1.9. Green Areas
1.10. Adaptation
1.11. GHG Compensation
1. New technologies and outreach
2.1. resident companies (tenants) in the cleantech sector and/or with actual low carbon product/services;
2.2. host of conferences, seminars and workshops related to sustainability;
2.3. use of website, social media, and other channels to raise awareness on sustainability and climate change issues and solutions;
2.4. visitors center to promote cleantech with regular visits from schools, foreign delegations and general public.
3. Local development
3.1. permanent groups, labs or institutes for sustainability/climate change research;
3.2. leadership or participation in a green city development, cleantech/low carbon cluster and/or regional climate adaption plan.
3.3. Active paricipation or support for sustainability/cimate policies.

Figure 1. Representation of contribution of STP/AOI on sustainability/climate change



Annex 2. Acknowledgements

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Table 2. Special Acknowledgements

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Table 3. List of IASP's survey respondents

STP/AOI	Country	City	Regional division
Science and Technology Park of Crete (STEP-C)	Greece	Heraklio	IASP Europe
Johanneberg Science Park AB	Sweden	Göteborg	IASP Europe
Feevale Techpark	Brazil	Rio Grande do Sul	IASP Latin America
University of Warwick Science Park, Ltd	United Kingdom	Coventry	IASP Europe
Associação Parque de Ciência e Tecnologia Almada/Setúbal - Madan Parque	Portugal	Caparica	IASP Europe
Polo de Innovación Garaia, S.Coop.	Spain	Arrasate - Gipuzkoa	IASP Europe
Kyoto Research Park Corp.	Japan	Kyoto	IASP Asia Pacific
Southern Taiwan Science Park Bureau, Ministry of Science and Technology	Taiwan (China)	Tainan City	IASP Asia Pacific
Technology Park Ljubljana	Slovenia	Ljubljana	IASP Europe
Parque Tecnológico de Andalucía	Spain	Campanillas (Málaga)	IASP Europe
Parque de Innovación de la Salle A.C.	Mexico	León de los Aldama	IASP North America
Västerås Science Park AB	Sweden	Västeras	IASP Europe
Tsinghua University Science Park - TusPark	China	Beijing	IASP Asia Pacific
Parc Micro Sciences de Trois Rivières	Canada	Quebec	IASP North America
Bilkent Cyberpark	Turkey	Ankara	IASP Europe
Parque Tecnológico São Leopoldo - TECNOSINOS	Brazil	São Leopoldo	IASP Latin America
Parque Científico Tecnológico de	Spain	Gijón	IASP Europe
Knowledge Oasis Muscat (KOM)	Oman	Rusayl(Muscat)	IASP Wana
Fars Science and Technology Park (FSTP)	Iran	Shiraz	IASP Wana
Parque Cientifico-Tecnologico de Pando	Uruguay	Pando	IASP Latin America
Technopark of the JSC ELMA	Russia	Moscow	IASP Europe
University of Tehran Science & Technology Park	Iran	Tehran	IASP Wana
INNOPOLIS Foundation	Korea	Daejeon	IASP Asia Pacific
TEHNOPOL Tallinn Technology Park	Estonia	Tallinn	IASP Europe
The Surrey Research Park	United Kingdom	Guildford (Surrey)	IASP Europe
Innovation Place Research Park	Canada	Regina	IASP North America

STP/AOI	Country	City	Regional division
Taguspark - Lisboa Science &Technology Park	Portugal	Oeiras	IASP Europe
Incubadora - Agência Inova Sorocaba	Brazil	Sorocaba	IASP Latin America
Kaunas Science and Technology Park	Lithuania	Kaunas	IASP Europe
Technoparc Montreal	Canada	Saint-Laurent, Québec	IASP North America
WISTA Management	Germany	Berlin	IASP Europe
Technology Park Malaysia Corporation Sdn. Bhd.	Malaysia	Bukit Jalil	IASP Asia Pacific
Mazandaran Science & Technology Park	Iran	Sari Mazandaran	IASP Wana
Kulim Technology Park Corporation Sdn Bhd	Malaysia	Kulim	IASP Asia Pacific
Central Taiwan Science Park Bureau, Ministry of Science and Technology	Taiwan (China)	Taichung City	IASP Asia Pacific
Poznan Science and Technology Park, Adam Mickiewicz University Foundation	Poland	Poznan	IASP Europe
Mjärdevi Science Park	Sweden	Linköping	IASP Europe
Modares Science and Technology Park	Iran	Tehran	IASP Wana
PIIT Parque de Investigación e Innovación Tecnológica (Research Park)	Mexico	Monterrey	IASP North America
Joensuu Science Park Ltd	Finland	Joensuu	IASP Europe
Menai Science Park (M-SParc)	United Kingdom	Bangor	IASP Europe
Wroclawski Park Technologiczny S.A.	Poland	Wroclaw	IASP Europe
The Innovation Hub	South Africa	Pretoria	IASP Africa
Science & Technology Park of Kurdistan	Iran	Sanandaj	IASP Wana
Thailand Science Park	Thailand	Pathumthani	IASP Asia Pacific
Autononomous Institution of Khanty-Mansiysk Region "High Technology Park of Yugra"	Russia	Khanty-Mansiysk	IASP Europe
York Science Park	United Kingdom	Heslington	IASP Europe
Teknopark Istanbul	Turkey	Istanbul	IASP Europe
Gyeonggi Institute of Science and Technology Promotion	Korea	Suwon-si	IASP Asia Pacific
TECHNOPARK®-Alliance	Switzerland	Zurich	IASP Europe
Village des Technologies, de l'Information, de la Communication et de la Biotechnologie Mahatma Gandhi - VITIB	Ivory Coast	Région des Lagunes	IASP Africa
Ester Limoges Technopole	France	Limoges, Cedex	IASP Europe
Porto Digital	Brazil	Recife	IASP Latin America
Yazd Science & Technology Park (YSTP)	Iran	Yazd	IASP Wana
High Tech Campus Eindhoven	The Netherlands	Eindhoven	IASP Europe
Utrecht Science Park	The Netherlands	Utrecht	IASP Europe

Annex3. Survey results

Table 4. Survey results - Sample

Region	Respondents		Members	Sample (Respondents x Members)
IASP Africa	2	4%	6	33%
IASP Asia Pacific	9	16%	6	18%
IASP Europe	28	50%	50	18%
IASP Latin America	5	9%	154	31%
IASP North America	5	9%	16	25%
IASP Wana (West Asia and North Africa)	7	13%	20	23%
	56	100%	30	20%
Total			**276**	

Figure 2. Survey sample

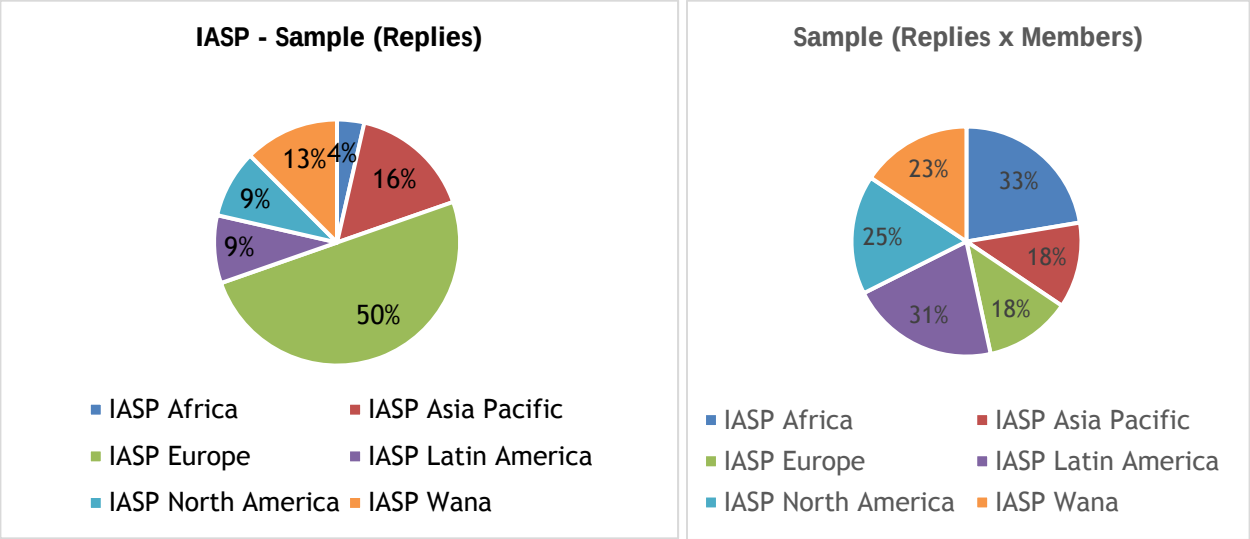


Figure 3. Survey result – The role of STP/AOIs in sustainable development/low carbon economy

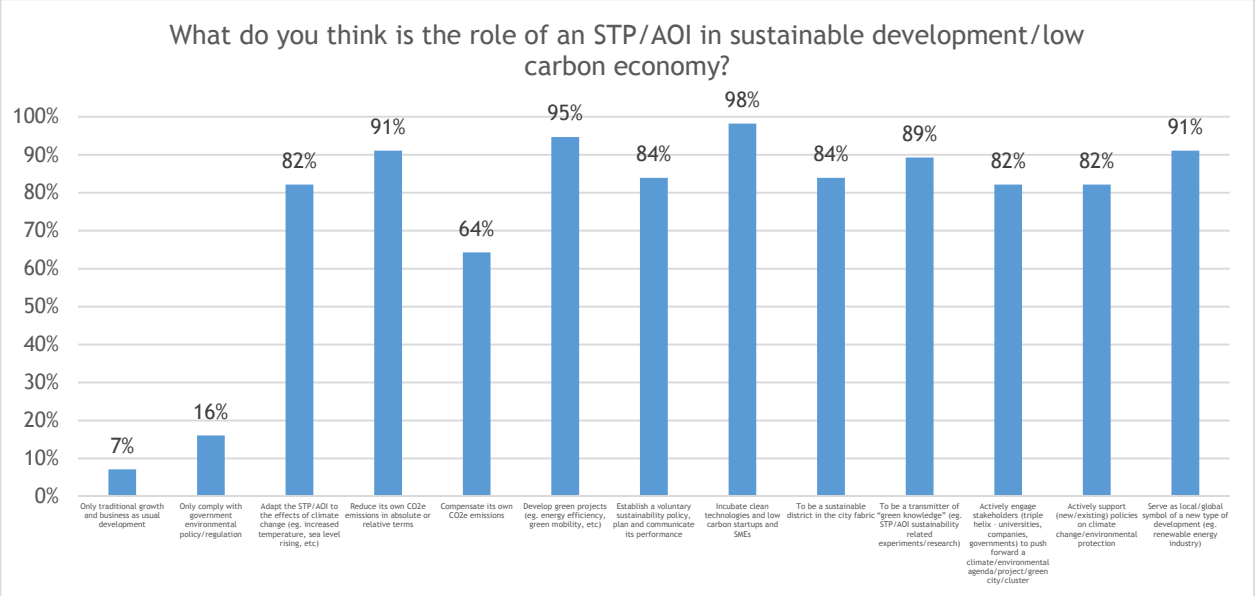


Figure 4. Survey results – Enablers for STP/AOI to become more active in a sustainable/low carbon economy

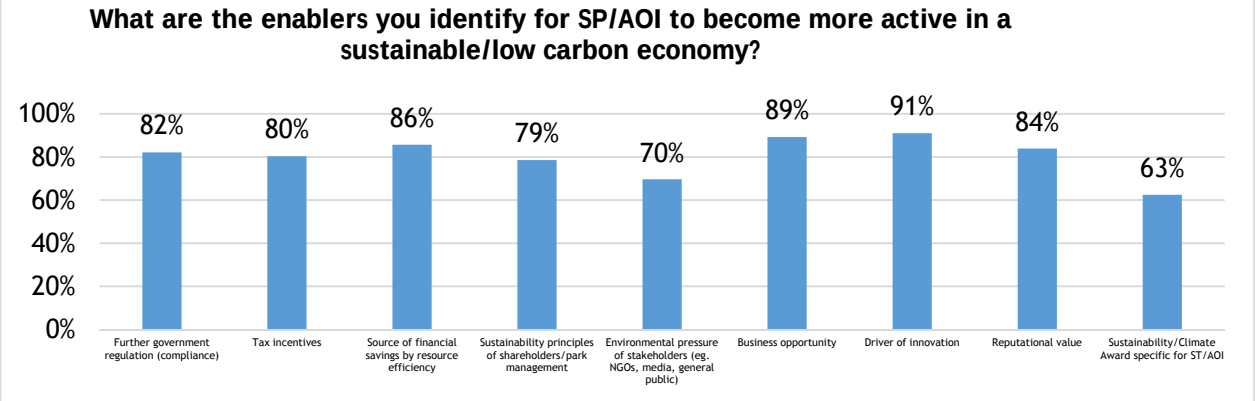


Figure 5. Survey results – Barriers for STP/AOI to become more active in a sustainable/low carbon economy

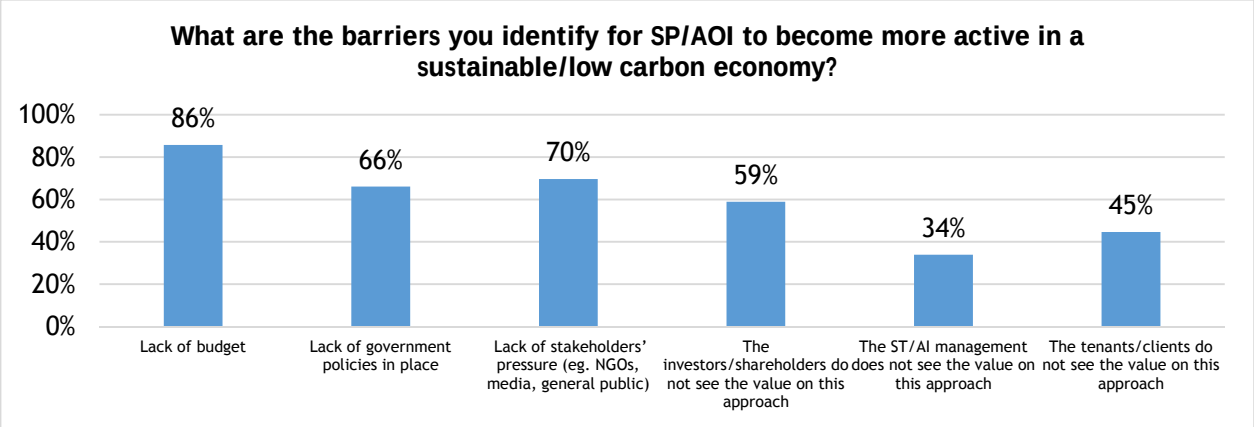
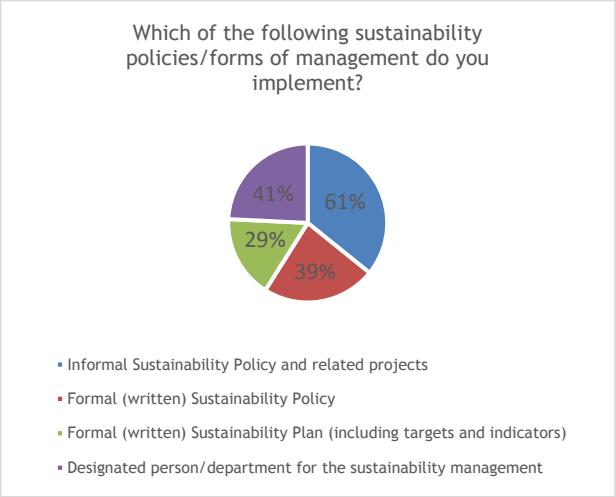
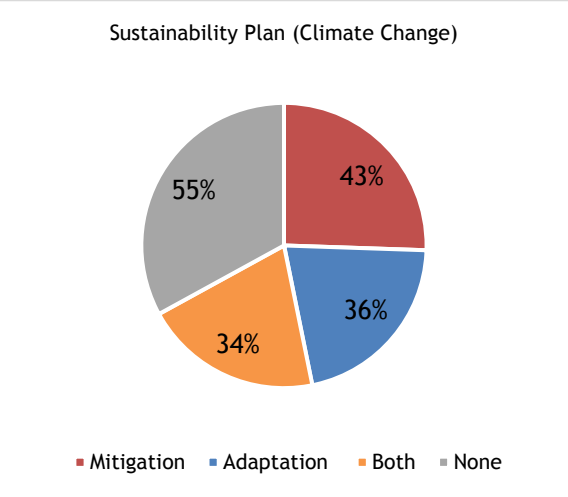


Figure 6. Survey results – Management practices





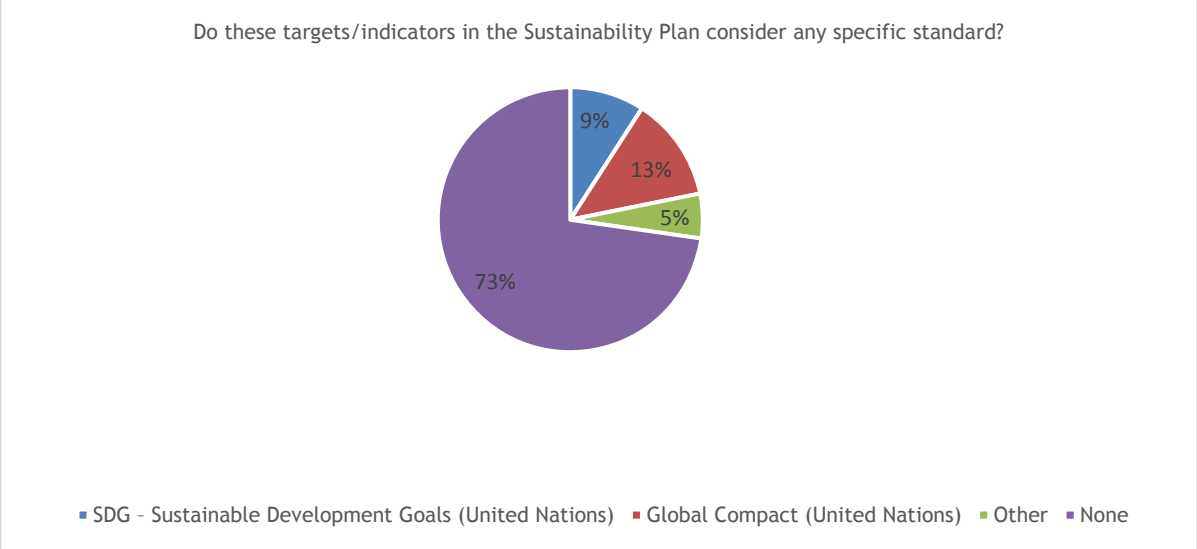


Figure 7. Survey results – Investment

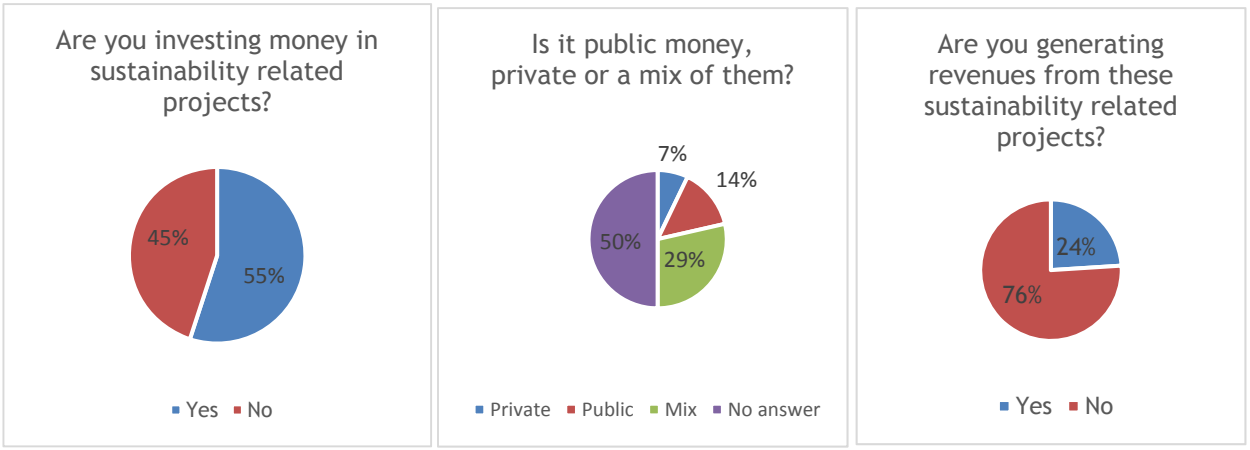


Figure 8. Survey results – Green initiatives