

A Game for all Seasons: Lessons and Learnings from the JRC's Scenario Exploration System¹

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Abstract:

The European Commission Joint Research Centre's (JRC) Scenario Exploration System (SES) is a foresight gaming system developed to facilitate the application of futures thinking to policy-making. It was originally geared at engaging EU policy-makers with scenarios in a facilitated process with a low learning curve. Specifically, the SES was designed to help participants, in less than three hours, to engage in systemic thinking with a long-term perspective and to explore alternative futures on specific issues and themes. When applied in various contexts, the SES proved to have a broader range of applications, which led to communities of practice emerging around the tool. Successful responses to various requests to apply the tool beyond its original focus demonstrated the versatility of the SES. Specifically we discovered its ability to accommodate a large array of scenarios to discuss a very diverse range of issues. The experience accumulated through several

¹ Our title is an intentional play on words that references the life of Sir Thomas More, who was executed by Henry VIII for not going along with his plans. One of more colleagues used this appellation, "a man for all seasons," to describe More's resolve. We humbly believe that the SES shows the same resolve with regards to its efficacy as a tool for exploring scenarios in a range of contexts on an array of topics.

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adaptations of the SES allows the analysis of the various strengths and weaknesses of the tool as a platform for futures thinking and sharing more broadly the know-how for the creation and application of new versions. Ultimately this article seeks to contribute a series of design suggestions for futures practitioners seeking to develop a playful mode of interaction with scenarios, or those seeking to repurpose the original SES system for use in their own project.

Key words:

Scenario Exploration System, foresight, scenarios, serious games

1. Introduction

In 2012, the European Commission's Joint Research Centre (JRC) was requested to perform a long-term foresight study on “eco-industries”. This study had a broad remit to engage in a systemic reflection on what a sustainable transition in Europe could look like. It ran in 2013-2014 and involved more than 40 people representing a broad range of professions, origins and perspectives. The work was published as a technical report (Bontoux and Bengtsson 2015) but perspectives for its further use were very limited in spite of the study team striving to overcome the difficulties encountered by many foresight projects to have policy impact (Cox et al. 2015).

This triggered a reflection on how to increase the impact of the study (and foresight scenarios in general) and engage with people who were not part of the process. This led the research team to consider serious gaming techniques and approaches, which have become more popular and widely used within the broader futures space (Wenzler and Chartier 1999, Valkering et al. 2012; Milojević 2017; Rosa and Sweeney 2019; Sweeney 2017; Sweeney et al. 2019; Vervoort 2018). As previously discussed, translating the original report (Bontoux et al. 2016) entailed collaboration with external futures research groups concerning the aspects of play that were to be incorporated through various game design decisions (Bontoux, et al. 2016b).

The purpose of this paper is to share the learnings accumulated from the use of the tool in a broad range of circumstances, and to explain how to adapt the tool to serve the needs of any potential professional user. The various mutations of the SES system also provide evidence for game design principles with particular potency for future-oriented projects (Rosa and Sweeney 2019).

2. Putting the SES into Context

While games had been used for serious purposes for a long time, Abt introduced the concept of “serious game” in 1970. The definition of this concept signals an attempt to define games with “an explicit and carefully thought-out educational purpose” that, importantly, are “not intended to be played primarily for amusement” (Abt 1970). At the time of his book’s release, Abt’s work was closely aligned with war games and red-team simulations used by military, intelligence, and security agencies during the height of the Cold War. With that said, war games have been played at the U.S. Naval War College since 1866. Such institutions—in the U.S. and elsewhere—continue to use serious games, simulations, and modeling approaches toward a variety of ends. However, the application of serious games is now expanding to other institutions, for example as teaching tools, public engagement tools or in civilian areas of policy making.

Even before “futures studies” or “strategic foresight” were recognised as such, games and simulations were often used to explore the future. Take the RAND Corporation, which pioneered a range of dice-based Monte Carlo “simulations” aimed at creating scenarios from a diverse range of driving forces (Kahn 1955). Within the social sciences, and political science in particular, games, simulations, and modeling approaches have been used for decades to prepare for the future, especially to thwart crises, for example overpopulation and the threat of nuclear armageddon (Djaouti et al. 2011; Lasswell 1977; Lopez 1978; Chadwick 2000).

Recently, many new game concepts have been created using traditional tools or taking advantage of online capabilities leading to a multiplication of platforms of play, new markets, and genres of games (Candy, 2018a; Fullerton, 2014). Overall, it seems that greater engagement is achieved through the use of physical games, which include card-based games, board games and role-playing rather than through online games (Dufva et al., 2015). Ultimately, games and simulations provide a means to “use the future,” since, as Dator points out, “games are the closest we can come to actually [...] pre-experiencing alternative futures so as to have a wider understanding of what might be viable preferred futures” (Dator, 2017).

Taking a historical perspective to the study of play often leads to a discovery of the powerful cognitive dynamic created by perceptions of the world and the desire to win (Caillois, 2001) (Sutton-Smith, 2001) and is strongly linked to culture (Huizinga, 1949). By enabling a sensorial and psychological distance from the urgency of ‘reality’ and by lending a creative freedom to the participants (Abt, 2002), a game is a powerful way to explore in advance possible ways forward, solutions, or preventive measures that would be impossible to come up with under the immediate pressure of real life events as they occur. The circumstances thus created by a futures-oriented game generate a safe space which is favorable to reflection. This has been referred to under numerous terms such as ‘the magic circle’ (Tekinbas & Zimmerman, 2003), ‘a ludic architecture’ (Walz,

2010), and a 'recursive space' (Wood, 2012). It is a critical function of play in serious game design (Schrage, 2000).

Advancements in data capture and analysis have influenced the evolution of futures games. Internet-based foresight games can engage thousands of people in collaborative scenario development (e.g. Foresight Engine¹⁶), knowledge creation and trend scanning (e.g. Co:tunity¹⁷ and TrendHunter¹⁸). However, the outcomes of these exercises are often huge unstructured datasets that require analysis and interpretation.

Finally, an often forgotten aspect of foresight games is their ability to give a fun experience. In this respect, Inayatullah (Inayatullah, 2017) noted that while (serious) foresight games are not applied for the fun that they can generate, the fact that they are pleasant to participate in increases their ability to reach their serious objectives.

The use of games in current foresight practice

The popularity of games amongst foresight practitioners and researchers should not come as a surprise, especially given the field's reliance upon a "possibility-space" to explore potentialities (Miller 2006). Indeed, games have become popular for "analyzing alternative futures by engaging with affective creation, interaction, and response" (Dator et al. 2013). Ultimately, the strongest connection between games and foresight centres on uncertainty. As uncertainty is often seen as a possible danger or as a hurdle to overcome before decision making, especially within the broader policy space, it is by helping people deal with it that foresight can make a useful contribution to policy-making. In fact, and that's an opportunity, within the context of games, uncertainty is an asset. As evidenced by Costikyan (2013, 2), "games require uncertainty to hold our interest, and [...] the struggle to master uncertainty is central to the appeal of games". This creates a strong driver to develop and use foresight serious games in support to strategic reflection and policy-making.

With a view to help clarify such a diverse landscape, Dufva (Dufva et al. 2015) proposes to classify foresight games on a triangular space according to their positioning between three specific objectives: providing information, offering first-hand experience, and/or being used as an idea generation platform. Typically, foresight games either pursue multiple simultaneous objectives or can be used in different modes to serve different objectives, which speaks to how they can provide a means to experience complexity and engage with uncertainty rather than merely discuss both. Figure 1 reproduces Dufva's triangle on which the SES has been positioned (Christophilopoulos et al., in press).

¹⁶ <http://www.iftf.org/what-we-do/foresight-tools/collaborative-forecasting-games/>

¹⁷ <http://cotunity.com>

¹⁸ <http://www.trendhunter.com>

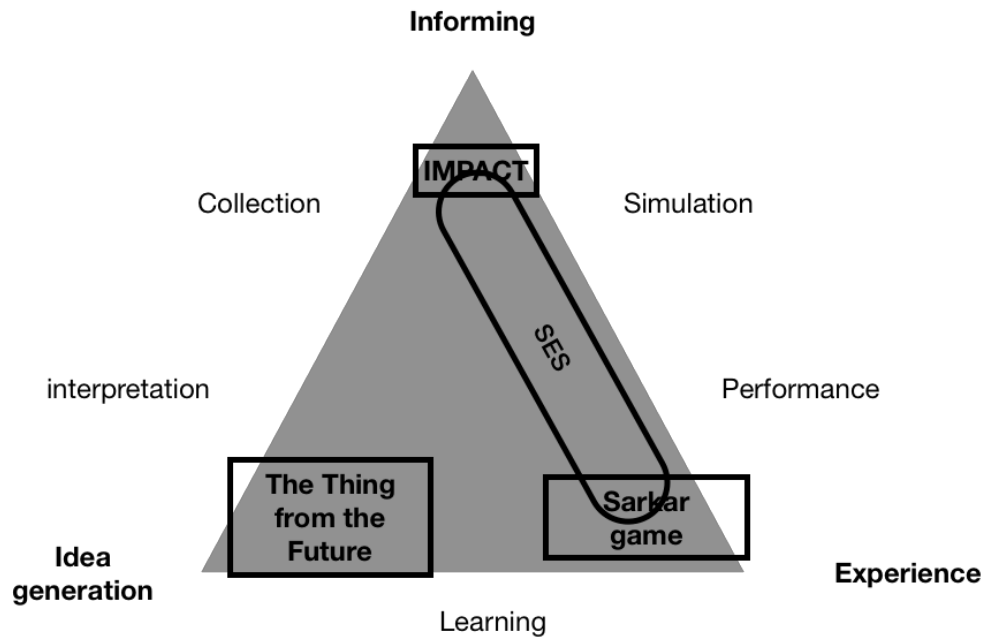


Figure 1. Classic foresight games placed on Dufva's model (Christophilopoulos et al., in press)

3. The SES in a nutshell

In “using the future” and involving uncertainty, the Scenario Exploration System (SES) builds on the rich tapestry of games deployed across the broader futures field. It offers the opportunity to four (or five) ‘*scenario explorers*’ representing different stakeholder groups (typically policy makers, businesses, or civil society organisations) to take action to reach their long-term objectives. This model is loosely based on the concept of the Hero’s Journey – a method for role playing across a topological field of future possibilities (Schultz, Futures, Crews, Consulting, & Lum, 2012). They do so across three time horizons (Curry & Hodgson, 2008) starting from the present in a context created by a scenario while interacting with each other under the judgment of a ‘*public voice*’.

At the start of a scenario exploration, after a theme of common interest has been selected, each ‘*scenario explorer*’ receives a limited amount of resources coherent with the context created by a relevant scenario. He or she must develop his/her role in sufficient detail and determine an objective to reach at the horizon of the scenario. Each ‘*scenario explorer*’ must then take action in turn, using his/her own resources, to try and reach his/her own objective. After each time horizon, the ‘*public voice*’ judges all actions and scores them. This makes it possible to calculate scores for the ‘*scenario explorers*’. ‘*Real Life*’ cards allow further interactions. A full session lasts 2.5 to 3 hours and consists in the consecutive exploration of two contrasting scenarios in which participants

keep the same roles and objectives. This helps people grasp the key constraints, drivers and uncertainties around a topic of interest.

Standard templates have been developed to record the basic content of each session for possible use in later debriefing. Observers or note takers can also contribute to a richer harvesting of what happens during a scenario exploration. The full details of the development of the original 'edition' of the SES (the *Sustainable Transitions* edition) were published elsewhere (Bontoux et al. 2016). The tool itself is available under a Creative Commons license (CC-BY-SA).

The fact that the SES is based on future scenarios creates a safe space to simulate possible responses connected to any issue of interest to the participants. Its set up is a vast oversimplification of reality but it still provides enough complexity to challenge participants in a way that is usually perceived as realistic. Also, the fact that '*scenario explorers*' only have a limited amount of resources to spend over their complete exploration and can only take one action per round focusses minds and pushes them to set priorities and be strategic. Figure 2 (below) illustrates a scenario exploration in progress.



Figure 2: A scenario exploration in progress

4. Main observations from initial SES demonstration and testing

Immediately after the development of the SES, the team embarked on a year of demonstration and testing of the tool with a very broad range of people and under many different circumstances (over 150 people, always on the original 'edition'). This was performed with a systematic request for feedback through a standard 12-question participant survey that produced some learning complemented by conversations with people who had just experienced a scenario exploration session.

During this testing, the SES showed that it can help people imagine what scenarios could mean for themselves and for the issues they are interested in. This offers the opportunity to translate what a broad future context could mean for very specific issues or stakeholders, a clear added value to prepare for decision-making. The tool also showed its ability to operate well with a very wide diversity of people in terms of age (12 to 67), gender, professional background and geographical origin. The Sustainable Transitions edition of the SES also showed its ability to be used to discuss a very broad range of topics using the same scenarios. In addition to questions directly linked to the sustainable transition itself, it was used to discuss renewable energy, the future of healthcare, migration, new business models for supermarkets, the impact of automation and other issues.

By the mere fact of using scenarios for the future, which are by definition imaginary, the SES also showed that it can create a safe, yet dynamic space for conversation so crucial to foresight; participants do not have to defend the agenda that they are pursuing today. In this way, there is a playful emergence at the heart of the SES that facilitates applied futures thinking. Also, the fact that the SES offers simultaneously different ways and different perceptions of winning makes it possible to avoid a single linear winner-loser relationship at the end of a session. This creates a more open field for conversation, more reflective of the complexities of the world and of a diversity of perspectives than a classic winner-loser relationship. This has been seen to facilitate conversations after a scenario exploration session between people who would have been unlikely to exchange in a meaningful way otherwise.

Feedback has shown that most participants (average score of 7-8 out of 10) recognise that the SES helped them think long-term and take a strategic perspective. Resource limitation and the setting of long-term objectives clearly promote the adoption of strategic thinking but the feeling of the practitioners is that this is unlikely to be the whole story. Other key elements are the presentation of a set of megatrends at the start of every scenario exploration and the prescribed narratives delivered by the '*scenario exploration master*'. This last element occurs in the three time horizons of the SES. While this forces a long-term time dynamic on participants, the creative license of the '*scenario exploration master*,' who aids in building a captivating story, may also help participants imagine longer-term futures.

On a different register, a majority of participants have also expressed their gratitude for the learning that takes place in a session, thereby confirming the potential power of role-play in this respect (Linser, 2004). This learning comes through two main channels. The first occurs when participants explain the rationale for the actions they take during scenario exploration, thereby sharing some of their own experience, knowledge and expertise with others. The second channel is the unexpected realistic situations that appear during scenario exploration sessions. This makes

participants discover unsuspected dynamics that promote systemic understanding of the issue being investigated. This dynamic is at its strongest when participants play roles where they have a lot of expertise. Typically, this happens when their roles are close to their real life occupation.

Another type of learning takes place when participants take up roles with which they are not familiar. In that case, the level of expertise to share around the table in terms of proficiency in the role is much lower. However participants make an effort to discover the world from a different perspective and must learn quickly what a person in this role would do in real life. The moderator and/or other participants can support this process.

Another interesting observation is linked to emotional engagement – another core component of critical and serious game design (Sylvester, 2013). As participants have ample freedom and creative agency to develop their own role, they tend to believe in the character that they have developed and in the actions taken. The roles feel real, especially when they are close to participants' real life activities (Aarseth, 2007). This leads to feelings of pleasure or disappointment depending on what happens around the board.

Discussions around possible collaborations are most of the time a particular moment of emotional engagement (Powers, 1986), and strong emotional engagement leads to better retention of the experience (Kear and Bown 2015).

4. Building experience on the use of the tool

The effort spent in demonstrating the SES to a large number of people eventually led to requests for applying it to new issues. This put the team in front of the challenge of developing versions tailored to a wide variety of issues and needs. The fact that the original edition had already proven to be successful to explore a diversity of issues with a wide range of people using the same basic set of scenarios was encouraging.

4.1 A first real-life application: food safety and nutrition

The first successful experience of adaptation of the SES was for food safety and nutrition. It was performed by the JRC's EU Policy Lab upon request from the Directorate General for Health and Food Safety (DG SANTE) of the European Commission to support a strategic reflection over how the policy work on food safety and food innovation could evolve after 15 years of a strong regulatory focus. This edition was developed by using existing scenarios from a foresight study on food safety and nutrition performed for DG SANTE (Mylona et al., 2016). It was applied with a set of DG SANTE's actual stakeholders in a simulation mode in a 1-day workshop format. This experience was part of a broader foresight exercise that is described in detail elsewhere (Bock and Bontoux, 2017). The SES

session was used to feed an internal strategic reflection exercise. The specific challenges here were time efficiency and relevance of outcomes.

Following this successful foray into EU policy-making and a large dissemination effort, more people started to enquire over possibilities to apply the SES to other purposes. This led to the development of a number of spin-off editions of the SES (presented briefly below) and to the discovery of new applications for the tool, in line with the team's effort to make foresight scenarios more usable.

4.2. Circular Ocean

This edition was requested by partners from the EU funded [Circular Ocean project¹⁹](#) in their efforts to find solutions to deal with waste fishing nets and ropes in Northern Europe. The purpose here was to create a constructive conversation between all stakeholders involved (fishermen, harbour masters, SMEs and fisheries agencies). This version was based on the *Sustainable Transitions* edition with a new set of roles developed to match the relevant stakeholder groups. This version was used at least twice (in Cork and Reykjavic) in multiple-table settings and led to requests for the original version of the SES by people related to the project. The experience with multiple tables in Reykjavic gave the first indications about consistency and reproducibility of outcomes.

Scenarios: sustainable transitions in the EU

Scenario explorers: harbour master, fisheries agency, fishermen, recycler (small or medium enterprise)

Target group: real stakeholders of the waste fishing net issue

Purpose: stakeholder engagement, connection along the full chain of actors to find practical solutions to the issue.

Challenges: novelty of approach on unsuspecting and unknown stakeholders

4.3. Dragon Star Plus

This edition was developed by partners from the EU funded [Dragon Star Plus](#) project with the help of the JRC as a basis for a EU-China conversation on long-term cooperation in science, research and innovation. It used new scenarios ²⁰ developed by the project

¹⁹ <http://www.circularocean.eu/circularnews/circular-ocean-hosts-irelands-first-scenario-exploration-event/>

²⁰ <http://www.dragon-star.eu/china-2030-research-and-innovation-landscape-just-released/>

(Christophilopoulos et al. 2017). The purpose here was to create conversations between European and Chinese stakeholders involved in R&I to feed long-term strategy development. This initiative managed to test SES China in a workshop in Shanghai with 40 participants, including the Minister Counsellor in charge of research from the EU Delegation in Beijing and the president of the Chinese Academy of Science and Technology for Development (CASTED). After having been used in a multi-table setting in Shanghai, this edition was then used in the context of the [ENRICH](#) project to help stakeholders reflect on the design of the European Research and Innovation Excellence Centres in China.

Scenarios: EU-China cooperation in Research & Innovation

Scenario explorers: Researcher, European university, European Commission, Chinese government, European/Chinese university, European/Chinese company

Target group: Chinese and European stakeholders in research and innovation

Purpose: Stakeholder engagement, promotion of dialogue, strategic reflection.

Challenges: cultural barriers, long distance planning, need to train moderators, high level participants

4.4. "Mobility is a Serious Game"

The mobility sector faces huge challenges but also offers many opportunities for development thanks to new technologies and services. "[Mobility is a Serious Game](#)" was developed in 2017 to explore the future of mobility with an open mind. It is a version of the SES that was co-created by 6 people professionally involved or concerned by mobility²¹. The game set is distributed by [The Shift](#) (Macharis 2018). Its purpose is to help address concrete mobility issues or explore future scenarios by putting a broad range of stakeholders around the table (business, government, NGOs and the public voice).

This version of the SES has been used in very diverse settings, ranging from business environments such as the top management at the Colruyt Group, to educational settings and working meetings of mobility experts to explore the implementation of autonomous vehicles.

"Mobility is a Serious Game" presents the scenarios on two double-sided boards, one scenario per side (See Figure 3). These scenarios are

²¹ C. Macharis from the mobility research group at the *Vrije Universiteit Brussel* (VUB-MOBI), K. De Maesschalck from the *Colruyt Group*, K. De Schepper from *Inland Navigation Europe* and *CleanAirBXL*, S. Vanden Brande from *Durabrik*, G. Boone from *Fockedey*, M. Vertriest from *Flanders' Netwerk Duurzame Mobiliteit*

constructed around two axes: "Individual vs Collective" action and «Welfare vs Wellbeing».

The tool was designed to be able to engage with a very broad range of stakeholders to discuss concrete mobility issues. The applications have been stakeholder engagement, promotion of dialogue, strategic reflection and problem solving.

Scenarios: mobility scenarios (*Harmonia*, *Symphonia*, *Silicon Europe* and *Communopolis*)

Scenario explorers: Business (x2), government (x2), NGO (x2)

Target group: Broad range of stakeholders, the public

Purpose: Problem solving, awareness raising, promotion of dialogue, strategic reflection.

Challenges: simplification and shortening of the sessions



Figure 3: The "Harmonia" board for "Mobility is a serious game"

4.5. Climate-KIC

The cooperation of the JRC with the European Institute of Technology's European knowledge and innovation community working to accelerate the transition to a zero-carbon economy (Climate-KIC), focussed on the project [Climate Mitigation Fund \(CMF\) 2.0](#). Here, an ad-hoc adaptation process was developed that led to the creation of two city-specific versions of the SES.

The Climate-KIC's CMF 2.0 project had engaged in an intense six-month conceptual phase to design local climate funds for Bologna (Italy) and Frankfurt am Main (Germany). However, the intended users were struggling to adopt the project results, which, while contextualized, were still too abstract. Many strategic decisions to reach implementation were waiting to be taken. In both cities, the local public administrations wondered whether they should own the process of setting up a fund or whether this endeavour should be led by business.

Applying the SES made it possible to bridge the gap between the abstract results of the EU-funded project and the local processes. The novelty here for the SES was that only one scenario was available: the long-term vision developed for each city. As the administrations were wondering whether they or business should set up the funds, the contrast needed for the SES was created by developing alternative paths towards each vision: a market-led one and a policy led one.

In practice, the process took place in two stages. First, local stakeholders in Bologna and Frankfurt developed visions for the future of specific neighbourhoods. This was then used to create (immediately after the visioning session in the case of Bologna) the contrasting narratives (a market-led and a policy-led path) needed for the scenario exploration. While the vision development and SES adaptation process took place through a two-day workshop in Bologna, in Frankfurt it followed a process in two separate steps over a few months. The SES was then used to help local stakeholders reflect concretely on how to achieve these long-term visions.

Adapting the resources for each role according to its relevance in a market-driven versus a policy driven scenario created very powerful learnings among the participants. The scenario exploration revealed how different framework conditions impact the opportunities and constraints of each of the roles.

Scenarios: Contrasted Market led vs. Policy led scenarios based on local visions developed in Bologna and in Frankfurt

Scenario explorers: business, government, NGO, funding/development agency

Target group: local stakeholders and residents

Purpose: reflect concretely with all stakeholders on how to combine policy actions and financial instruments to *green* a city or neighbourhood.

Challenges: having only one vision instead of contrasting scenarios, need to make an adapted version in real time, diversity of participants, cultural differences.

4.6. EU-Innovate

This edition was developed by partners from the EU funded [EU-Innovate](#) project with the help of the JRC to get people to reflect on the eco-innovations that would be needed to achieve sustainable lifestyles. The time horizon of the exercise was 2050. It used [sustainable lifestyle scenarios](#) that had been developed by the earlier EU funded [SPREAD](#) project.

In this version of the SES participants interact with radical social, political and economic changes that would have to take place in society to achieve four contrasting sustainable lifestyles by 2050 (see Figure 4).

The EU-Innovate SES introduces a fifth scenario explorer role - the *citizen innovator* - and a “post-truth” public voice. The *citizen innovator* represents the opportunity for citizen-led innovation to catalyse the shift towards a sustainable Europe, while the “post-truth” public voice represents the “new” normal of social media where experts are dismissed, alternative facts are offered and citizens can offer opinions on everything.

As coordinator of the EU-Innovate project, the Academy of Business in Society (ABIS) produced and disseminated 100 boxes of this edition of the SES to test and apply it further across its network (business and academic).

Since the beginning of 2017, ABIS has supported the delivery of two demonstration sessions during its annual events in Brussels with more than 50 people participating in each event. The opportunity for academics and business representatives to experience such sessions led to the organization of two pilot workshops with students at Cranfield Business School in the UK and Aalto University in Finland.

ABIS and the EU Policy Lab also jointly ran a webinar on the SES which is being used by the ABIS network to understand the game rules and components and its possible application as an educational tool. Since then, this edition of the SES has become a standard teaching tool for Master’s level students at Cranfield University.

Scenarios: sustainable lifestyles scenarios from the SPREAD project

Scenario explorers: policy maker, civil society organisation, small entrepreneur, established business and citizen innovator

Target group: businesses, interested citizens, students

Purpose: generate concrete reflections on how to innovate and create business opportunities to achieve sustainable lifestyles.

Challenges: project partners not familiar with foresight, relatively old scenarios invented elsewhere

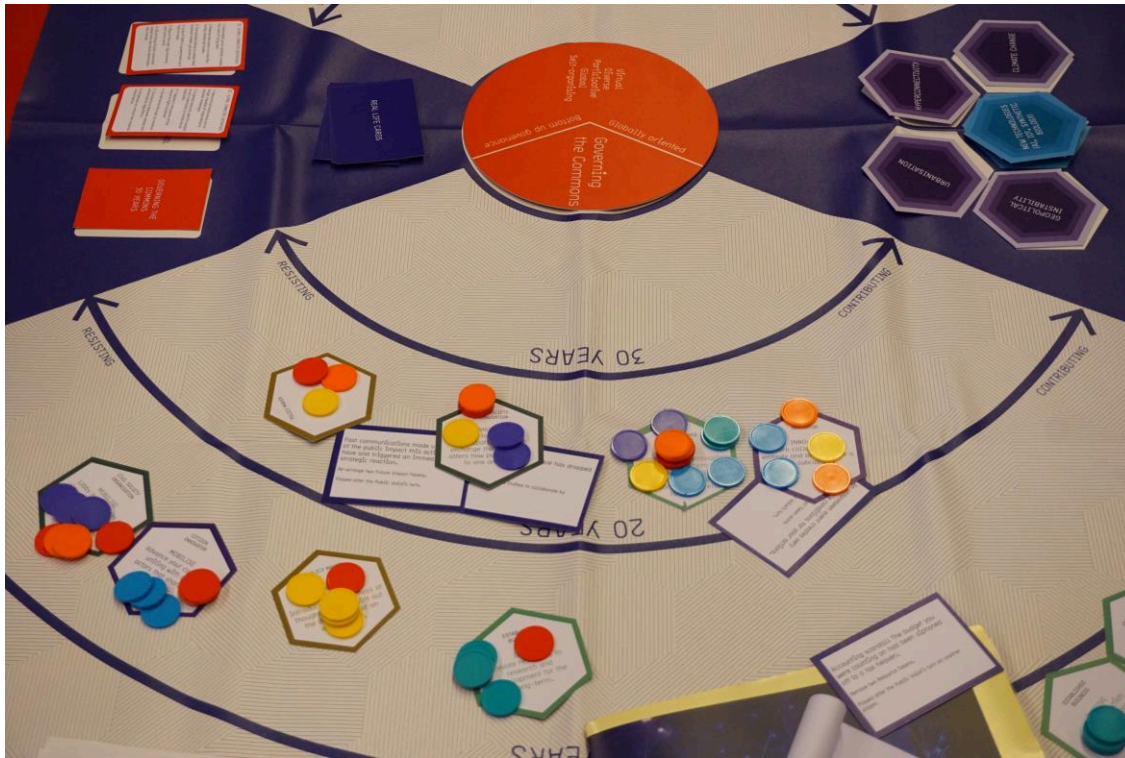


Figure 4: The EU-Innovate version of the SES in action

4.7. NANO2ALL

This edition of the SES was prepared by the JRC and its partners from the EU funded [NANO2ALL](#) project. Its purpose was to make stakeholders and the public reflect more in-depth on the future applications of nanotechnologies and on how to make sure that research and innovation in this domain become more responsible. This SES's project team established a logic articulated around how technophile versus technophobe a society is and how "centralised versus de-centralised governance is, creating tailor-made scenarios. This version has been translated into six languages (EN, ES, FR, IT, PL, SE) for use by science museums in six countries in stakeholder engagement workshops.

Scenarios: purpose made scenarios focussed on openness to technology

Scenario Explorers: policy maker, civil society organisation, researcher, business

Target group: citizens and stakeholders concerned by nanotechnologies

Purpose: deepen the general debate around nanotechnologies and how to achieve responsible research and innovation in an inclusive way; generate policy recommendations to achieve these objectives.

Challenges: need to train multiple moderators, creating 6 language versions, cultural differences

4.8. JRC foresight project on the future of migration in the EU and beyond

The JRC foresight project on the future of migration in the EU and beyond developed this edition of the SES to help stakeholders dealing with migration from very different positions reflect on the multiple facets of the issue and develop in-depth reflections. The key point was to help participants move beyond this politicised and often-polarising issue and grasp the complexity of migration processes and policymaking. As such, this was meant to inject more long-term thinking into the policy debate and reveal the importance of reaching beyond migration policies and collaborating with diverse stakeholders to better manage migration in the EU. This edition of the SES applies migration 2030 scenarios derived from global scenarios developed by the Organisation for Economic Cooperation and Development (OECD) and UK Foresight. It was used in several occasions with very different target audiences, both from the EU and from migrants' countries of origin. This showed the ability of the SES to operate well across widely diverse cultures, sometimes involving people from Africa, Asia and Europe around the same table. The project resulted in a *Migration* discussion toolkit, also available under Creative Commons, offering six discussion tools in addition to the SES to stimulate forward-looking debates about migration. The *Migration* edition of the SES is now being used further with migration officials from countries of origin, EU Member States and at universities.

Scenarios: Migration 2030 scenarios

Scenario Explorers: policy maker, civil society organisation, migrant, agency

Target group: policy makers, citizens, stakeholders dealing with migration, students

Purpose: generate concrete reflections on how to address migration issues and to improve migration policies, strengthen collaboration among migration stakeholders and support coherence with other policies that shape migration flows and outcomes.

Challenges: need to create adapted scenarios, diversity of potential stakeholders, need to operate across cultures

4.9. Operation Sustainability: the city greening game

This edition of the SES was developed by the JRC jointly with the Directorate General for the Environment of the European Commission (DG

ENV). The objective here was to develop a stakeholder engagement tool in the context of *Green Week 2018* that could be used to help people reflect on urban sustainability issues in a systemic perspective. *Green Week* is a yearly conference and set of side events across the EU Member States to promote and reflect on EU environmental policies and discuss environmental issues. Requirements were that the tool could be used across the EU (in all EU languages) with the ability to engage with the broadest possible public. In view of the time constraints and of the lack of suitable scenarios, this request created the opportunity to develop and test a streamlined and comprehensive process to generate a completely new edition of the SES. Building on the experience from the EIT Climate-KIC adaptation, the objective was to go from the creation of scenarios from scratch all the way to the production of a fully functioning SES prototype (all SES elements) in a few days. This succeeded here and this edition of the SES (see Figure 5 below) has been translated into eight official EU languages so far. The positive feedback received after the scenario exploration session at Green Week 2018 led DG ENV to request the organisation of a larger similar session at Green Week 2019.

Scenarios: purpose made broad European urban scenarios

Scenario Explorers: city authority, civil society organisation, national authority, business

Target group: broad public and relevant stakeholders

Purpose: support a citizen engagement effort to reflect on sustainability issues for the future in the run up to Green Week 2018.

Challenges: time pressure, lack of adequate scenarios, need to have a tool that can work for many cities across the EU under very diverse circumstances

5.1. Functioning with a very broad range of people

First of all, and in view of the largely positive feedback received from the numerous participants we engaged with across the projects presented above, the SES has shown its ability to work with a very broad range of people. To date, it has been used with participants from 12 to 67 years old, on three continents (Europe, North America and Asia), and with people from extremely diverse cultural and professional backgrounds. As stated previously, all these experiences left a feeling of satisfaction on the part both of the participants (as witnessed by participants surveys) and of the users of the SES in all the projects mentioned here. The tool has also shown its ability to make participants engage constructively at all hierarchical levels (e.g. *Mobility is a serious game* was played at company board level, the Dragon Star Plus SES involved the president of the Chinese Academy for Science and Technology for Development and a Minister Counsellor from the EU Delegation in Beijing) and in spite of very large differences in hierarchical levels around a single table (Christophilopoulos et al. 2018). Sessions have also been held both in homogeneous (e.g. in Bologna, Cork or Frankfurt) and heterogeneous (e.g. multinational European, EU-China, EU-emigration countries, etc.) cultural environments with equal success (Szczepanikova and Van Criekinge 2018, Christophilopoulos et al. 2018). Experiences with participants from diverse professional backgrounds and types of education (often also multicultural) showed the ability of the SES to create constructive conversations to address complex issues between people who would not easily engage in a constructive conversation spontaneously, e.g. industry-NGO (Bock and Bontoux 2017). Beyond evidence from participant surveys, success has been assessed largely on the basis of the decision from the original requesting projects to use the tool further after the end of the initial assignment, often in a different setting.

5.2. Ability to deal with any topic

Secondly, as demonstrated by the examples of adaptation described above, the SES can be applied to explore a broad range of issues or topics of interest. Not only can each set of scenarios be used to discuss various subjects (as was demonstrated by the original edition of the tool), but the ability to change scenarios expands the possibilities tremendously. It is also interesting to note that the scale of the question to be discussed in a scenario exploration session is to a large extent determined by the scale of the scenario used. In other words, scaling the scenarios is what scales gameplay. For example, while the discussions in Bologna focussed on issues at the scale of a city neighbourhood, discussions on EU-China research cooperation in the Shanghai workshop raised high-level, international scale governance questions (Christophilopoulos et al. in

press). In the NANO2ALL project, conversations were at the scale of one technology (nanotechnology).

5.3. Creating a positive and constructive atmosphere

Thirdly, extensive use of feedback surveys after SES sessions showed a clearly positive picture. Typically, three fourth of participants find the experience enjoyable, get engaged in long-term future thinking and find the platform useful to learn from each other and to enlarge their frame of reflection. Critical comments relate mostly to issues that could be addressed by enhancing the performance of the moderator, to elements that were not optimised for the particular issue explored or to misaligned expectations from the participants. In cases where the SES was applied as a very innovative methodology, with no previous track record of successful application of serious games and in an ambiance of apprehension, especially in Frankfurt and in Shanghai, the experiences have proven to be positive and convincing, both on the side of the organisers and of the participants (Christophilopoulos et al. in press). This fits well with previous experience on serious games (Ritterfeld et al. 2009).

5.4. Consistency and reproducibility

The Reykjavik experience must be noted as particularly interesting in at least one respect. It is the only time several parallel sessions (four in this case) were run on the same specific issue using the exact same roles with the same objectives and the same two scenarios in the same sequence. The scenario exploration masters and the participants were the only difference. As the exercise was performed to try and generate recommendations in line with the specific objectives of the Circular Ocean project, all tables were instructed to draw concrete conclusions from the scenario exploration. At the end of the exercise, when all ideas were collected, we discovered a large degree of consistency across tables. This would be worthy of further investigation and points toward the tool's utilization as a research device beyond knowledge-sharing and collaborative insight generation.

The SES was used in parallel tables using common sets of scenarios and broad role types in several other occasions but never with such level of coordination as the objective is usually to explore the breadth of possible perspectives around a topic and not to go in depth in one very specific issue.

5.5. Results from scenario explorations

As mentioned above, the diversity of projects with which we engaged made us discover a rich landscape of potential outcomes from the application of the SES.

The '*basic data harvest*' foreseen as a standard in the tool is the use of the templates provided to all participants: the scenario explorers write down a brief description of their roles and then record the actions that they take at every round. The public voice describes the bias that it is taking when judging the actions taken by the scenario explorers and then notes for each round and each scenario explorer the main points justifying the expression of that judgement. The scenario exploration master records the scores.

This basic harvest can be used as a basis for debriefing discussions after a session but does not capture the sophistication of the conversations and negotiations taking place during the scenario exploration.

Using a dedicated observer and note taker (who can ask questions of clarification to the participants during the scenario exploration) offers a much richer harvest, specifically tailored to the issue of interest. This is what was done for example in the project with the Climate-KIC.

We have seen scenario explorations used to generate and collect concrete ideas about a very specific issue: for example, the Reykjavik sessions were used to harvest ideas on what could be done with waste fishing nets.

In other cases, people were not so much interested in a specific documented outcome of the session, but more in the mental exercise and the reflection generated by the scenario exploration as a way to broaden the thinking of the participants and make people discover the systemic complexity of an issue. This was particularly the case with the EU-Innovate edition used at Cranfield university to challenge students and with the NANO2ALL edition to help people discover the positive and negative sides of applications of nanotechnologies as well as the different perspectives that the various stakeholders would have on them.

In other cases, the SES sessions were used as a sort of icebreaker when people did not know how to make stakeholders with very different group cultures and little initial trust engage constructively. This was the case in the first use of the tool in the Circular Ocean project. The various partners had very different approaches and ways of communicating and some were afraid to be saddled with additional burdens and were therefore reluctant to share much. The safe space created by the SES, in which participants took their real life roles, worked very well to make people feel at ease, get to know each other and share a lot of very practical and realistic information, each in the mode that they felt most comfortable with.

In the case of *Mobility is a Serious Game*, what people needed was a tool to help put stakeholders around a table to solve real life mobility issues

(e.g. improve a problematic crossroad). There, the emphasis is not so much on the future but on putting all relevant stakeholders around the table, making them reveal their diverse perspectives and expose very quickly the systemic dimensions that have to be taken into account. Participants also come up spontaneously with proposals for solutions that elicit immediate feedback in a constructive way. The outcome of such an exercise is a group of people with a shared understanding of a very specific issue, recognition of the various perspectives and a common knowledge of the possible ways forward. The future dimension comes from the time needed to develop and apply a solution.

In yet other cases, the main outcome that was sought was a fresh approach to feeding a long-term strategic reflection (e.g. food safety and nutrition, *Dragon Star Plus*). This happened both by having the interested parties taking their own roles in the scenario exploration sessions and by harvesting specifically strategic elements of the conversations taking place during the scenario explorations.

6. From a specific tool to an adaptable platform

The accumulated experience presented above has taught us a lot about the adaptability of the SES, the relative ease with which new editions can be produced, and how it can be tailored to specific needs and circumstances. After a few years of usage we can now say with confidence that the SES has turned out to be a very flexible platform for using foresight scenarios that can be tailored to specific needs in a number of ways. From the simplest to the most extensive, the levels of adaptation are:

1. Using an existing version to explore and discuss different issues;
2. Changing the trends, drivers and other contextual elements while keeping the background scenarios and roles from an existing version to address specific needs;
3. Changing the roles on an existing version to cater to specific stakeholders;
4. Changing the scenarios (and contextual elements) but keeping existing roles to explore new issues;
5. Changing the scenarios, the contextual elements and the roles.

Smaller changes around the platform can be easily introduced to tailor any scenario exploration session to the needs: how to deal with variable drivers, adapting variable drivers, changing megatrends, changing rules of collaboration, imposing specific characteristics to the roles, etc. Of course, it is also possible to simply change the participants. All this can be done on the go and requires minimal work.

One important lesson from the last three years is that one set of good quality broad scenarios can be used to generate very interesting explorations on a wide variety of topics. For example, the original

scenarios (sustainable transitions) were used to explore issues as diverse as migration, food safety, the future of healthcare, the roll out of renewable energy sources, the increasing use of automation, etc. In other words, one does not necessarily need tailor made scenarios to discuss a particular issue. Table 1 provides an overview of the effort and expertise needed for each level of adaptation beyond a good understanding of the tool.

Level of adaptation	Effort needed	Know-how needed
1	Minimal	Minimal
2	Minimal	Some understanding of what are trends and drivers
3	Minimal	Topical know-how on the issue of interest
4	From limited if scenarios are available to potentially extensive if one needs to develop fully fledged high quality scenarios	Scenario building know-how needed
5	From limited if scenarios are available to potentially extensive if one needs to develop fully fledged high quality scenarios	Scenario building know-how needed

Table 1: Levels of effort and expertise needed for each level of adaptation of the Scenario Exploration System

Adapting the scenario explorer roles in any SES edition is very easy and gives a lot of scope to expand the range of applications and issues explored and to tailor the tool to specific needs. For example, creating specific roles has allowed the Circular Ocean project to focus discussions on the recycling of waste fishing nets and ropes using the original sustainable transitions scenarios. However, it should be noted that to ensure a successful scenario exploration, the roles should belong to clearly defined stakeholder categories and be sufficiently independent of each other.

The utilisation of existing scenarios from different sources to create a new edition of the SES is also quite easy, as illustrated by the EU-Innovate project. It simply requires two main interventions. First, for each

scenario, to create a plausible sequence of events in three time steps that would take participants from today to each end scenario; then, for each scenario, to attribute a coherent amount of resources to each role.

Creating a new version of the SES with entirely new scenarios requires more effort as this adds the need to create the new scenarios in the first place. The time needed is then largely impacted by how much effort is dedicated to the creation of the new scenarios. Two examples illustrate this issue. The first is that of the Climate-KIC, in which the visions developed by the project could be very quickly used to make new versions of the SES. The second is that of 'Operation Sustainability - *The City Greening Game*', for which a 1-day fast-track process was developed to generate all the material needed for a new 'edition' of the SES. The principle is as follows:

1. Gather a large enough group (10-15?) of competent and complementary people for developing the scenarios of interest.
2. Use the morning to run a quick scenario matrix building exercise (e.g. from drivers of change to the identification of a scenario logic in four quadrants).
3. Spend just enough time on each of the quadrants so that all participants 'get' the scenarios.
4. In the afternoon, split the participants in groups and develop the stories bringing us from today to the scenarios in three time steps.
5. Quick review for completeness and consistency.
6. Identification of the desired roles and attribution of resources per scenario.

After such an exercise, the only work left is that of actually producing copies of the new edition of the SES. Again, this can take from one or two days up to months, depending on the scale and sophistication of the effort. The preparation of the *City Greening Game* gave first-hand experience of this process that can be shared with potential future users.

7. Applicability of the platform

Looking back on the experience accumulated so far, one can identify three main domains of applications for the SES.

7.1 Forward-looking strategic and systemic reflection

Forward-looking strategic and systemic reflection was the original intention behind the development of the Scenario Exploration System. This objective seems to be achieved quite well if one is to believe the response statistics of the SES feedback surveys and the experience in the European Commission (Bock & Bontoux, 2017). The dynamic interactions between scenario explorers, the influence and considerations brought by the public voice, the availability of limited resources and the external

constraints brought by the scenarios force participants to engage in strategic and systemic thinking without realising. This aspect emerges most strongly for the policy-oriented activities illustrated above (e.g. food safety, migration). The long-term perspective brought by the scenarios also seems to work, but participants usually have difficulty making full use of the contextual megatrends presented at the start of the sessions. One possible explanation is that as the SES provides a lot of 'dynamic' information to participants, so that information that might appear to be more static as part of the background gets forgotten. Also, the long-term impacts of megatrends are usually not something most participants reflect much upon and are familiar with.

7.2 Engagement

This has been the most popular way to use the SES among non-policy users in the EU projects in which we participated. Three main variations were observed:

- Engage with a broad range of diverse stakeholders to discuss the many dimensions of a broad issue in an open but structured way (e.g. mobility) to try and make solutions emerge;
- Engage with a targeted public representing specific groups of stakeholders on a specific issue to elicit ideas for implementation at policy or industry level. For example, reflecting on future applications of nanotechnologies in specific domains helped understand how to make future R&D more 'responsible', while reflecting on sustainable lifestyles shed light on the types of innovation that are needed. The specific focus does not prevent the emergence of results, which are more broadly applicable;
- Engage with a specific chain of (local) actors to make them work together better to solve a very practical (but so far intractable) issue. This helps break the ice and create awareness of each other's perspectives and constraints to unlock conversations on win-win solutions (e.g. mobility, climate mitigation).

More generally, the SES appears to be able to create conditions favourable to mutual learning from participants and for networking, as it is often used to bring around a same table people from very diverse backgrounds, who would have otherwise never met. The SES, while being an extreme simplification of the world, also creates conditions which are sufficiently challenging to push people into thinking out of their comfort zone, thereby leading to self-learning and creating awareness of issues or aspects previously unknown to the participants or underestimated. Finally, the SES has proved to be an interesting way to promote the EU Policy Lab and to bring the European Commission closer to EU citizens as exemplified by the efforts around Green Week 2018.

7.3 Education

Since 2016, many scenario exploration sessions were held to demonstrate the tool to people who were curious about it and wanted to understand it better. While this can be perceived as not being a 'use' of the SES per se, reflecting on what happened running tens of demonstration sessions showed a certain usefulness of the exercise in various respects.

First of all, the application of the SES in projects in which people in teaching positions were partners opened a door on the use of the SES as a tool for teaching. As a result, it has been used in sessions with bachelor and masters students in various European universities and teaching institutions to pursue different learning objectives. The merits of games for learning have long been known (Bokyeong et al. 2009) and these initiatives with the SES build on a whole body of previous evidence.

In the first applications, professors were interested in exploring students' approach to foresight scenario exploration with a particular focus on sustainable business models, dealing with the content of a particular course. Then, it became clear that a scenario exploration represented a great exercise to develop transferable skills beyond the classic negotiation, communication and adaptability skills, which are highly recognized by the job-market, such as:

- Public speaking;
- Debating, developing the ability to support a position or viewpoint with argumentation and logic;
- Combining and integrating information from disparate sources;
- Evaluating critically a given situation;
- Engaging in advocacy work;
- Open-mindedness.

SES sessions have also proven very useful to evaluate students on their ability to mobilise knowledge and skills in more realistic sets of circumstances than traditional exams.

So far, the SES has been incorporated into the curriculum of a Bachelors' course on European Integration at the Department of Public Governance and Management of Ghent University. In what is a mandatory course for third-year students, groups of volunteers act as game masters and others as scenario explorers. The tool helps them learn about the complexity of migration policy making at the European level. Scenario explorers are pre-assigned roles by the teacher and are expected to study positions and responsibilities of different migration stakeholders in advance. After the exploration, they write a reflection paper about the experience and lessons learned which is graded as part of their overall evaluation.

Furthermore, the Academy of Business in Society - ABIS has supported the delivery of two SES sessions with students in higher education. The first at Cranfield Business School as part of the Managing Corporate Sustainability Module of the Master in Management and the second at

Aalto University as a session on the Sustainable Entrepreneurship Day connected to their *Sustainable Entrepreneurship* course.

Both sessions differed with respect to the background context each professor decided to use for the game. In Cranfield, each table played in the context of an established business, which they had been studying with their team during the course (e.g. IKEA, Zara). This approach made it easy to identify the scenario explorers most relevant to that business and helped the students understand the concrete societal dynamics driving the company's evolving business case. In particular, students appreciated the opportunity to explore the scenario not only from the perspective of the business, but also from that of other stakeholders such as the policy maker, the small SME part of the value chain or the civil society organization.

During the session hosted at Aalto University as part of the Sustainable Entrepreneurship course, students were required to develop a scenario exploration session based on a sustainable business model, possibly inspired by Helsinki's entrepreneurship system.

Despite the differences between the two teaching environments it was clear in both sessions that students experience the scenario exploration with a pace and point of view very different from that of adults. They are able to understand the rules of the exploration quickly and to assume roles of scenario explorers far from their current knowledge - such as civil society organizations or policy makers. In this regard, particularly during the Cranfield session where most of the participants were international students, the SES offered the opportunity to explain and discuss the European political system at national, regional and local levels (see Figure 6).

The way in which the role of policy-maker is handled by students is indeed one of the main differences from how adults approach scenario exploration. Students naturally assume that established businesses have long expanded beyond the administrative and geographical boundaries that constrain politics (Van Vrekhem 2015). The fact that politics are still organized nationally while companies and industries are organized internationally was a recurrent point of discussion among the students in each session. In contrast, adults are generally more aware of how the political context influences business and vice versa.

Students generally showed a great enthusiasm and participation during the SES sessions. Data from feedback surveys reveal that students appreciated how the exploration dynamics taught them to come up with ideas quickly and to translate those ideas into action. For some, the SES session was an opportunity to build further ideas created during their courses. Students valued particularly the role of the Scenario Exploration Master in providing feedback to participants throughout the session, and in supporting the scenario exploration and the resulting learning process. They commented that the SES not only taught them something new

about sustainability, but also offered examples and inspiration of how to apply sustainability in the multi-faceted social context of the real world.



Figure 6: Master students exploring scenarios for sustainable businesses

Secondly, as most participants had no knowledge about foresight, this was an opportunity to provide them with an introduction about forward-looking studies in general, showing people how scenarios can be used and lowering the threshold of entry into this type of approaches. This has a strong 'demystifying' effect on how people perceive foresight. It makes it clear that while foresight is not about prediction, the Scenario Exploration System can generate very concrete conversations about the future that show to people the simulation value of scenarios beyond modelling or forecasting.

7. Conditions for a successful use of the SES

Regardless of the robustness of the results and successes booked so far with the SES platform, one has to be conscious of a number of limitations.

First and foremost, the experience is strongly dependent on the quality of the moderation. In addition to being familiar with the scenarios, the moderator should make an effort to build a narrative adapted to the specific interests of the people around the table. Being able to relate the story to current or local events familiar to the participants also increases the 'believability' of the story. This improves the quality of the session significantly by making it easier for participants to 'get into' the scenario exploration.

If it is not already clear, the SES is a scenario *exploration* system, and not a scenario-building tool. As a consequence, there are limitations to the extent to which scenario explorer actions can change future conditions. The exploration only takes place in the space left beyond the key characteristics of the scenarios. The moderator must find creative ways to accommodate the few cases when scenario explorers bump into this limitation.

The SES can accommodate any role, but there are constraints on the selection of sets of roles that can be used successfully: the roles need to be sufficiently independent of each other so that each has its autonomy of decision. For example, boss-subordinate relationships do not work.

It is difficult to hold a full session in less than 3 hours. This time is to a large extent incompressible because the introductory phase is crucial to make participants feel at ease and understand well enough what is expected of them. Also, dropping the exploration of the second scenario removes a significant part of the added value of the exercise while saving less than 45 minutes.

Scale up requires more moderators. While a session requires a minimum of 5 people (4 scenario explorers and one public voice) and a moderator, there is flexibility to increase this number in two main ways. One way is to add a few roles without having to change the rules (e.g. one more scenario explorer, one more public voice, one or two additional participants with a 'media' role). Another way is to attribute the roles to teams of two or three people. Using these tricks can easily increase the number of participants around a table, but it is not practical to go beyond about 12-15 people. Beyond that, scaling up requires adding moderators and running tables in parallel.

8. Conclusion

The SES was developed originally to create novel ways to make the results from classic foresight scenario studies more accessible and useful to people beyond those directly involved in the studies. However, the experiences described above have showed that the tool has evolved well beyond this scope. Overall, the range of experiences reported here have created a body of empirical evidence that the authors believe support the following hypothesis: by reducing the abstraction of future thinking, by putting participants in situations in which they can make the future more concrete, by allowing people to put their own stories and issues into scenarios, the SES makes foresight more usable, engaging, and ultimately playful. The authors hope that sharing this body of experience will give others the chance of building more solid evidence to support academic work both on the SES itself and on the usefulness of foresight gaming systems.

Results from experiences with a very wide range of people from all walks of life (the public, policy makers, business, academia, civil society organisations, etc.), all ages and all cultures demonstrates the tool's wide applicability and appeal as a point of entry for engendering futures thinking. So far, some observations have been made that can be considered as preliminary successes in helping to create better dialogue amongst diverse stakeholder groups, enriching strategic reflections, and creating a space for people to engage in more systemic reflections. In this way, the SES has proven to be a game for all seasons. As a tool, the SES shows that participation in foresight can be both a product and a process, which is to say that play-based approaches generate both intended and serendipitous outcomes, which is evidenced by the growth

As mentioned above, serious games have seen an expanded adoption across sectors during their history. From defence war-gaming, to business strategy formulation, innovation idea generating, and now futures research, there is an initial novelty factor that generates excitement in early adopters of serious game methods - an excitement that carries over from practitioners to participants who feel they are a part of something new. A hope that maybe this technique will provide sought after answers to complex quandaries. However, just as the polish of silverware will wane over time as a result of its continued exposure, so to does the initial wave of adoption and experimentation as a new approach enters into a space. Can this be said of serious gaming's place within a wider futures methodology? And if so, what can be done to return the gleam, and efficacy, of such practices?

We believe that the mutations of the SES, and various experiences recorded and discussed above, begin to show the resilient benefits of serious gaming in three main areas:

- Facilitating and strengthening forward-looking strategic and systemic reflection;
- Facilitating engagement with a large number of stakeholders and target audiences both in diversity and in close circles; and
- Awareness raising and interactive approaches to learning about internal and external complexity of a given subject area.

The first area has proven most beneficial in policy related contexts at the European Commission (Bock and Bontoux, 2017).

The second area has been of most benefit for projects interested in finding concrete ideas to solve specific issues (e.g. mobility, recycling waste fishing nets) or to enrich the public debate about hot topics (e.g. nanotechnologies).

Regarding the third area, the return on experience from two universities (Cranfield and Ghent) also gives interesting clues on the potential of the SES for teaching. In particular, students appreciated how the scenario exploration dynamics taught them to come up with ideas quickly and to translate them into action.

With each edition, interest in the SES continues to grow. At the JRC, this work will continued to be carried out with the goal of reaching a large enough community of proficient users (both experienced moderators and people able to tailor the platform to different needs) such that a community of practice develops around the SES, which will ensure that the tool continues to serve the foresight field beyond its original scope. As this community emerges, we are looking forward to performing a more in-depth and longitudinal study of this foresight tool, which will also contribute more broadly to assessing play-driven approaches at the intersection of research and public engagement.

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