

Knowing your SDGs: Using peer-led assessment to support authentic learning in sustainability

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Abstract

Universities have important roles in both educating and preparing individuals to support the United Nations' (UN) Sustainable Development Goals (SDGs). However, SDG literacy is low amongst higher education (HE) students in United Kingdom (UK) universities, with students often finding it difficult to relate their studies to the SDGs and to understand how they themselves can tackle the challenges facing society today. In this cross-school, inter-disciplinary initiative connecting first-year urban planning and biodiversity undergraduates, students designed and presented subject-specific posters relating to the SDGs and used a peer-assessment protocol to learn from each other's work. Pre- and post-surveys collected students' knowledge of, perception of and confidence in their understanding and application of the SDGs and focus groups enabled reflections on the poster events. Students from both schools identified the benefits of the authentic assessment in both their understanding and their communication skills. Furthermore, SDG knowledge and awareness within the student cohort evidently increased and the event proved to be important for developing learning communities. Overall, this study emphasises the value of inter-disciplinary, peer-focused events in widening perspectives of sustainability and, in doing so, creates opportunities for enhancing students' sense of belonging.

Keywords: authentic learning, sustainability, peer-led education, experiential learning, inter-disciplinary education

Introduction

In 2015, the United Nations (UN) set seventeen 'global goals' to "*end poverty, protect the planet, and ensure that by 2030 all people enjoy peace and prosperity*" (UNDP, 2024); these became widely known as the 'Sustainable Development Goals' (SDGs) and are now embedded worldwide in policies, as well as in industrial and academic practices, to promote their delivery. The recent 2024 SDG Report (UN, 2024) celebrated progress in specific areas, such as the reduction of child mortality, the prevention of HIV infection and increased access to energy and mobile broadband, but showed that most areas, including climate change and economic inequality, had failed to improve. Inevitably, there came widespread calls for much increased change.

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Universities have, arguably, a significant role to play in educating and enthusing students about the SDGs and importantly, in helping students identify how they might contribute to achieving them when taking up their chosen profession (Chankseliani and McCowan, 2021). University graduates are more likely to take on roles of greater responsibility within society – for example (DfE, 2023), a much greater proportion (66.3%) of United Kingdom (UK) graduates were in high-skilled jobs than non-graduates (23.6%) – and thus it is imperative that students are appropriately informed of the potential global costs and benefits of their chosen professional fields and learn how they may mitigate the possible negative effects of their future work decisions. In addition, a higher education (HE) institution's responsibility lies not only with its students but extends to the public, for universities play a vital role in informing local communities through their outreach programmes (McClure, Hudson and Higgins, *tbp.*).

Towards this aim, universities have increased their provision of education in sustainable development (ESD), but these initiatives do not come without challenges: they are often limited to isolated subject areas and students and staff alike may well see them as merely a check-box exercise (Macagno, Nguyen-Quoc and Jarvis, 2024). Indeed, a 2022/23 survey across UK HE identified that while 82% of students wanted to see sustainable development more actively addressed in all courses, only 34% indicated that “*using resources efficiently to limit the impact on the environment and other people*” had been covered in their course (SOS, 2024). As a result, HE students have limited understanding of the SDGs, particularly their application within their own fields, not to mention in others’ (Zamora-Polo *et al.*, 2019).

Experiential learning, whereby students engage in ‘real-world’ tasks or tackle ‘real-world’ challenges, has been shown to enhance motivation and learning in students (Herrington and Herrington, 2006; Tsaushu *et al.*, 2012). Within the field of sustainability, authentic learning experiences have been shown to enhance knowledge and problem-solving skills (Asgarova, Macaskill and Abrahamse, 2023). Furthermore, it is argued that such initiatives – when delivered across programmes or across disciplines, rather than being contained within specific modules – can help students to understand sustainability in relation to their life experience rather than as an academic problem, thereby giving it relevance and supporting the development of higher-order learning (Cross and Congreve, 2021).

In addition, the opportunity to learn from a wider variety of sources, including one’s own peers, can help to build knowledge and motivation in students (Tinto, 2003). Peer-peer learning requires students to educate each other, so crystallising the information in the mind of the aspiring *teacher* as well as offering students a more informal context to engage with novel material (Topping *et al.*, 2017). Peer-focused educational experiences can strengthen bonds between students, enhancing a sense of belonging within a cohort, a process known to promote motivation for learning and knowledge-sharing between peers (Toole and Louis, 2002). As a result, incorporating authentic and peer-focused initiatives to engage in holistic ESD may be able to provide students with an effective approach for identifying and appreciating the SDGs and their application.

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Building on this rationale in this case study, we implemented a novel, cross-school, peer-led initiative whereby university students presented to each other their posters on the SDGs, which students within and between the participating cohorts assessed. The aims of the study were to:

- determine the effectiveness of the initiative in increasing students' understanding of the SDGs;
- identify the impact of the event on students' perceptions of the value of the SDGs and their confidence in the application of these goals to their lives and studies;
- assess the value, as perceived by the students, of the peer-led learning experience.

Method

Participants

This project sought to consider how student awareness and understanding of the SDGs in their own subject context might be developed and enhanced through a peer feedback and poster presentation activity. The participants were two level-one undergraduate student cohorts at Queen's University Belfast, respectively taking a 'Biodiversity' module (135 students) at the School of Biological Sciences (SBS) and a 'Design Principles in the Built Environment' module (23 students) at the School of Natural and Built Environment (SNBE). Both cohorts were alike in having, as part of their assessment portfolios, a poster presentation assessment method aligning with SDG application in the environment; their contrasting academic disciplines were sufficiently different, nevertheless, to enable student exposure to new SDGs-related knowledge, yet with a similar enough assessment to facilitate peer-led learning.

Procedure

Both cohorts were required to present a poster of their projects (in small groups for SBS students; individually for SNBE) and show an appreciation and understanding of the SDGs in their work (appendix 1). Following their presentation, students were asked to review the posters of the other cohort and provide peer feedback, using a generic proforma (appendix 2). As a result, both student groups experienced presenting and explaining their work to 'non-expert' peers.

To gauge their baseline understanding and appreciation of the SDGs, students were asked to complete an online survey before their poster presentations. The survey was repeated a week after the poster event and the results were compared. There were 32 responses to the pre-poster event survey (16 responses from each cohort) and 25 responses to the post-poster event survey (18 SNBE and 7 SBS).

The first section of both the pre- and post-surveys tested student knowledge of the SDGs (for example, '*Can you identify this SDG?*'). Section two asked students to rate their confidence in identifying '*how the SDGs can be addressed or implemented practically*' and to select which of the SDGs they felt were relevant to their studies and future careers. The post-event survey also asked students to what extent the cross-school event had helped them to '*understand the elements of an effective poster*', and '*how the SDGs can be applied*'.

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Two focus groups (consisting of three student volunteers from SBS and four from SNBE respectively) probed the student experience for us and gauged the impact of the authentic exercise. These focus groups were separate, to allow a more open discussion with the students about the posters they had reviewed (for example, *'What surprised you about the poster exhibition from the other school?'*) as well as about their experience of presenting (*'What were the most useful skills you feel you gained from your poster exhibition?'*). They also explored the applicability of the SDGs to the students' own learning (*'How important do you think the SDGs are to your studies and your future career?'*) and the impact of the poster event (*'Have the poster events changed your thoughts on this?'*).

The project was subject to and granted ethical approval by the Queen's University Belfast Faculty of Medicine, Health and Life Sciences Research and Ethics Committee (Ref MHLS 22_159). The cross-poster events were supported by the Innovation in Teaching Fund in the Faculty of Engineering and Physical Sciences, Queen's University Belfast.

Data Analysis

Quantitative data from the surveys were assessed using non-parametric, Kruskal-Wallis tests with Dunn pair-wise comparisons (as the data did not conform to a normal distribution) across the two factors tested (i.e. *Student School* and *Pre- vs post-survey*). All analysis was completed using R version 4.4.1 (R Core Team, 2024).

The focus groups were recorded and transcribed by the second author, with common themes being identified from observation of patterned responses and meanings according to Braun and Clarke's six phases of thematic analysis (2008:87). Once identified, these were linked to relevant aspects of the quantitative analysis where appropriate.

Results

Thematic analysis of the focus group transcripts and an investigation of the two sets of survey results led to the emergence of three themes for discussion here: 1. Value of the learning experience; 2. Value and Confidence in SDG Knowledge; 3. SDG Visibility in learning/learning environment.

1. Value of the Learning Experience

Both cohorts of students demonstrated a small increase in knowledge of the SDGs after the event, with more correct answers on the quiz element of the survey. However, these increases were not found to be statistically significant ($p > 0.05$ (SBS: Pre $\bar{x} = 5.44$; Post $\bar{x} = 5.86$; SNBE: Pre $\bar{x} = 4.19$; Post $\bar{x} = 4.72$; maximum score = 6). We noted that the difference in baseline SDG knowledge between the cohorts was statistically significant ($p = 0.03$), with a higher baseline score for those in SBS.

The survey and focus group allowed for the students' learning to be explored in more depth. Students reported that both the poster event and survey were

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valuable learning experiences: “you have to know what you’re talking about when you’re explaining your work” (SNBE Student 4);

“[I] had to think and be aware of questions” (SBS Student 2);

“if only marked, you wouldn’t have to know as much [as opposed to explaining the poster](SBS Student 3);

‘the survey was really useful...being tested helped my knowledge’ (SNBE Student 4).

Students noted the challenge and learning opportunity in presenting to an unfamiliar audience who had a different knowledge base from their own:

I “[It was] a good learning experience...how to communicate to someone who doesn’t know” (SBS Student 3);

“it was good talking to people, teachers, people you weren’t used to” (SNBE Student 1).

When acting as reviewers of the other cohort’s posters, the disciplinary difference made this experience difficult but valuable:

“it was hard not knowing what something means” (SBS Student 3);

“I felt like I was reading without prior knowledge, but that taught me a lot” (SBS Student 1).

Students in both groups made comments on ‘*broadening understanding*’ through reviewing the other students’ posters. They also highlighted the value of the proforma in providing their feedback:

“the sheets to go round with helped us” (SNBE Student 3);

“made me read in depth” (SBS Student 1).

This was reiterated in the survey, where students showed an improved confidence in identifying elements of effective posters (figure 1A).

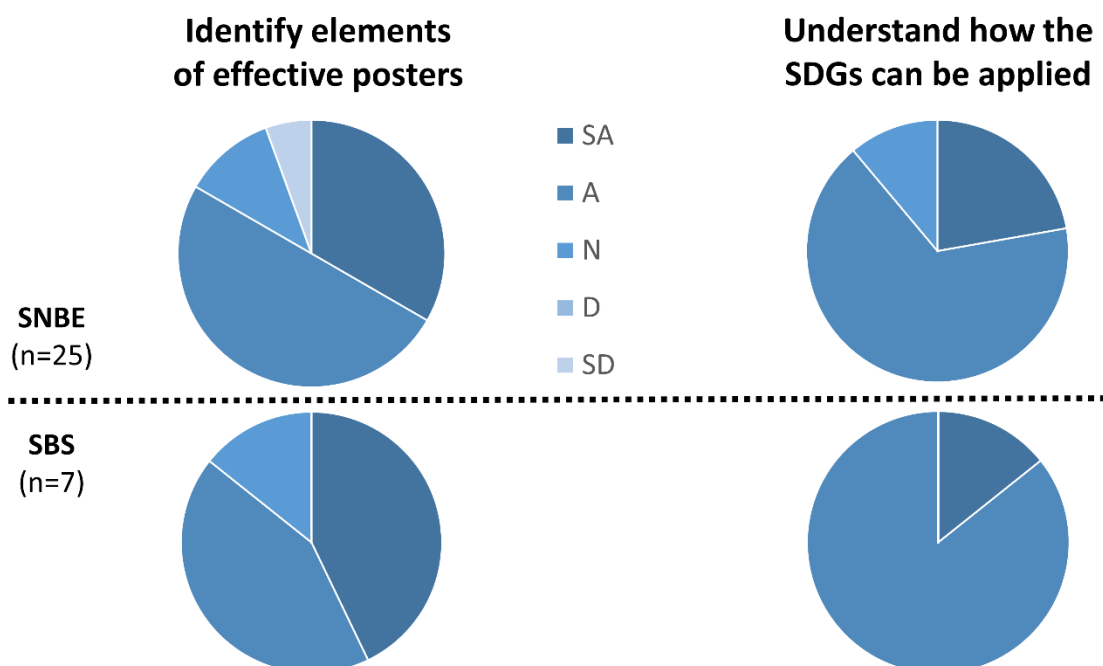


Fig 1. Proportion of students who felt the cross-school poster feedback initiative helped them A) Identify elements of an effective poster, and B) better understand how the SDGs can be applied. SA = Strongly Agree, A = Agree, N = Neither, D = Disagree, SD = Strongly Disagree.

2 Value and Confidence in SDG Knowledge

The cross-poster events increased, although not significantly, the confidence students had in their SDG knowledge (SBS: Pre \bar{x} = 2.19; Post \bar{x} = 2.29; SNBE: Pre \bar{x} = 1.50; Post \bar{x} = 1.72; and how the SDGs can be applied (figure 1B). Students in the two cohorts tended to consider different SDGs in their discipline-specific academic work, yet there were some overlaps, highlighting the SDGs as a valuable common ground between the disciplines that can enhance learning:

“[It was] good to see the same SDGs being approached from a completely different angle...something completely different that I hadn’t considered” (SBS Student 3).

SBS students showed an appreciation of considering perspectives on the SDGs from another discipline: *“made you consider other aspects, like the impact on people” (SBS Student 3); “makes you think about other topics and the wider impact...look at the bigger picture” (SBS Student 1).*

A reflection upon ‘considering the larger impacts around what you’ve studied and is your work achieving those goals’ coupled with a connection to the climate crisis and ‘making sure we have a future’ (SBS Student 3) clearly demonstrated the effectiveness of the project in allowing students time for reflection in a ‘real-life’ context, rather than merely in an academic exercise. This

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is somewhat supported by the survey results which show that the cross-school event increased – although again not significantly – students’ confidence in how the SDGs may be applied and implemented (BS: Pre \bar{x} = 2.00; Post \bar{x} = 2.29; SNBE: Pre \bar{x} = 1.19; Post \bar{x} = 1.50). One student mentioned that the topics observed in the posters were “something we’ve talked about at home” (SNBE Student 2), again highlighting the connections being made to life outside the classroom and demonstrating an authentic learning experience.

SNBE students showed an awareness of the disciplinary differences between the posters and the approach to the SDGs, commenting that the SBS approach was:

“more focused on the environment”, “seemed very clear, ours was a broader approach” (SNBE Student 1), and

“more integrated into their project, it was more direct, easier” (SNBE Student 2)

They also reflected less on whether or not reviewing the posters had influenced their learning. For this group, there was only a marginal increase in the number of SDGs that they felt were relevant to individuals’ studies and future careers after the events (\bar{x} = 6 post vs 5.75 pre), whereas a significant increase was observed in the SBS students (\bar{x} = 8.14 post vs 5.5 pre, p = 0.04).

3 SDG Visibility

In response to the cross-poster events, the students unequivocally highlighted the need for SDGs to be part of ‘daily learning’ and to be:

“more in the forefront of our minds” (SBS Student 1).

Suggestions included increased use of the icons, for example, by adding them to lecture slides and other resources. Comment was made on needing to see the application of the SDGs on campus generally, to emphasise that the SDGs are:

“having an impact” (SNBE Student 1).

These comments suggest a keen awareness of the relevance of the SDGs in daily life as well as study, which could be harnessed in the broader HE context. The comments further suggest a need for reassurance that the SDGs are being achieved, reiterating the sense of potential anxiety a lack of action on the goals may cause.

Evaluation

SDGs provide a unique opportunity to connect students' academic studies to a broader, more authentic 'real-life' learning activity. Our having placed students in a context where they were required to explain their work to 'non-experts' helped them to see the significance of their studies in relation to the SDGs, as well as bolstering an important presentation-skill activity.

The project resulted, as the survey data revealed, in a small – though not statistically significant – increase in students' knowledge of the SDGs and their confidence in applying them to their life and studies. The authors acknowledge that the limited number of respondents to the pre- and post-surveys may have contributed to the lack of statistically significant findings and/or that the lack of observed change may have been due to the average survey scores being close to the maximum, particularly for SBS students. These points suggest that further investigation with a larger sample and a more sensitive test may yield more substantial improvements.

As for students' perceptions of the value of the SDGs, the focus groups revealed interesting insights about what students valued about the experience. They appreciated the opportunity for social networking and connection and this seems to have been related to the learning process, rather than separate from it, as is often the case in the university context. Indeed, facilitating such social-learning opportunities has been shown to initiate and strengthen connections between students, expanding individuals' learning communities (Mitchell and Sackney, 2009). The establishment of learning groups may foster in students a sense of belonging that can enhance wellbeing as well as knowledge acquisition (Freeman, Alston and Winborne, 2008). Though 'belonging' was not an explicit aim of the project, it is noted here as a valuable by-product of the project that warrants focused exploration in the future. It is also worth mentioning that students noted the benefits of in-person speaking – building confidence after a period of online learning – particularly in an informal setting where they could meet and speak to new people freely, exemplifying the 'ripple effect' and nuances of authentic learning (Freeman *et al.*, 2021).

Whilst eco-anxiety was certainly not the aim of the exercise, it is worthwhile to note that authentic learning activities may be useful in bringing home important messages relating to the SDGs and improving sustainability literacy (Freeman *et al.*, 2021). Taking part in activities where the issues such as the climate crisis are directly addressed may contribute to students' feeling more connected to the issue.

There were some limitations to the project. The 'front loading' of SDG teaching was notably more embedded in the SBS syllabus, which has, it appears, fostered a greater critical reflection from SBS students than evident in the SNBE cohort. Drawing on the feedback from the focus groups, increasing the visibility of the SDGs across their modules – as well as dedicated lecture sessions on the SDGs – should prove helpful in future.

The authors considered how the exercise could have fostered deeper authentic learning. By opening up the poster events to the wider public, this may have supported students to explain and reflect more critically on their work and could be a valuable area to explore in the future. A key skill in most degree programmes, including those in this study, is communication to non-expert audiences. While this was captured within the cross-school initiative, diversifying the

audience to include members of the public could enhance the authenticity as well as the public value of the event.

It may be beneficial for students to engage in another reflective exercise to allow them to take action on the SDGs. Some SBS student groups engaged in informal, reflective processes from the learning activity, whereby they organised real-world environmentalism-related activities between them, such as beach clean-ups and sponsoring endangered animals. These self-motivated actions demonstrate the adoption of authentic and critical learning from the event and task and could be an element to consider promoting within future iterations. An opportunity for activism in relation to the SDGs may be beneficial in developing a critical understanding of political and social issues (Lin, 2015). It may also offer an opportunity to connect authentic learning experiences with a wider campus community through green networks and initiatives which could further enhance learning and achievement of the SDGs.

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Appendices

Appendix 1 – Student poster presentation briefs

SNBE Assignment Brief:

Individual Design Strategy and Site Proposals

For this individual assignment, you are asked to use your skills and knowledge of urban design and planning issues to act in the role of an urban designer working for ABC Council. Each of you has been part of a group that has prepared a thorough and comprehensive analysis and initial Urban Design Strategy for Dromore. You will prepare two (A2 format) sheets and a supporting statement, which contain and illustrate your ideas relating to: -

Your urban design strategy for Dromore;

Ideas for the future development of your chosen brownfield site within Dromore Town; and

The achievement of the UN Sustainable Development Goals in urban design and planning.

The UN Sustainable Development Goals are a collection of 17 global goals adopted by all United Nations Member States. They are designed to be a "blueprint to achieve a better and more sustainable future for all". Set up in 2015, and anticipated to be achieved by 2030, these goals seek to realise human rights of all, achieve gender equality and empower all women and girls, eradicate poverty in all its forms everywhere and end world hunger.

In this project, you are asked to consider how your design proposals will contribute to SDG 11: Sustainable Cities and Communities, and any of the other 16 SDGs that you think are relevant to your project.

Project structure and Guidance

Following on from your group project analysis submission, you are asked to prepare two A2 sheets and a 1000 word supporting statement. Guidance on each section is given below:

1. Sheet 1: Urban design strategy for Dromore

This sheet should be divided into sections, giving detailed visual and annotated information relating to the themes identified in your Group Urban Design Strategy (or others below which you may wish to add). The visuals may be maps, edited photos, images of other places, sketches or street sections.

Growth on brown-field sites (compact neighbourhoods).

Creating robust and flexible spaces which may be shared.

Creating playable, walkable, and bicycle friendly neighbourhoods.

Improving access to public transport.

Creating mixed-use neighbourhoods with a range of housing choices.

Protecting built and natural heritage (eg wildlife corridors).

2. Sheet 2: Proposals for a brown-field site

This sheet should give detailed visual and annotated information relating to your specific ideas for your chosen site. It should include the following components:

Map or plan with graphics (coloured arrows, shading, symbols etc. as appropriate) to show your response to issues such as access, movement, public realm etc., for your new site proposals and the wider context and appropriate annotations.

Visuals of your design ideas including a 3D SketchUp model from different angles showing how it will look in context. [A Sketchup file to help you do this has been prepared and is available here \(this can be used in the free version of Sketchup on your personal computer\)](#) Download [A Sketchup file to help you do this has been prepared and is available here \(this can be used in the free version of Sketchup on your personal computer\)](#). You could also consider sections through your site showing your ideas regarding heights and relationships of new blocks in relation to existing urban blocks.

Photos or sketches of your chosen precedents to indicate ideas about appropriate materials, finishes and architectural style—examples from other sources of an appropriate use, scale or style. Please note location, date and source.

3. Supporting Statement

Your supporting statement should:

explain how you devised your overall design strategy and site-specific design ideas.

reflect on the Sustainable Development Goals and how you have taken them into consideration in your work

discuss the context for the urban design strategy, the specific considerations for your selected site, international precedents you have identified and to incorporate alternative design ideas that you may have rejected.

This statement should also reference all secondary urban design readings that shaped your design solutions (the bibliography is never included in the word count). Make sure to include a reference list.

SBS Assignment Brief:

Global Issues Posters

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The aim of this piece of coursework is for students to work as a group (3-4) to produce an accessible overview of the often complex issues related to nature conservation and climate change mitigation and adaptation, in poster form. Posters are intended to be “Briefs” which will provide key information on selected issues.

Task

Groups are allocated a Biodiversity ‘theme’ via the Virtual Learning Environment which they are to create a poster on, and present in a group setting to educate peers on the allocated area of concern. The poster is to cover information often found in an International Union for Conservation of Nature (IUCN) “Brief”, but are presented in the form of an A1-sized poster using the following headings:

- What is the issue?
- Why is it important?
- What can be done?
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Groups are given ~8 weeks to complete this task and are expected to meet regularly either online or in-person in addition to a total of three in-person scheduled sessions (scheduled for weeks 2, 4 & 6 of the assignment timeline) to discuss and complete the posters. Dr Lorraine Scott (Module Coordinator) and Dr Colin McClure monitor progress amongst the groups.

Students are expected to research their allocated theme as a group, and include information from primary, peer-reviewed literature in the poster, while also using effective referencing. Examples are provided and critiqued in the scheduled sessions to demonstrate effective elements of a poster.

Appendix 2 – Student Poster Proforma

Please complete the following rubric to assess and give feedback to your peers. Circle a rating for each section and provide a comment.

Poster Number: _____	Rating (1 = poor, 5 = excellent)				
Criteria	(Circle the most appropriate rating for each section & provide additional comments)				
<u>Poster Criteria 1</u>	1	2	3	4	5
Is the poster eye-catching?					
<u>Poster Criteria 2</u>	1	2	3	4	5
Is there a continuous and effective theme across the poster?					
<u>Poster Criteria 3</u>	1	2	3	4	5
Is there a good use of space in the poster?					
<u>Poster Criteria 4</u>	1	2	3	4	5
Is it easy to access the information in the poster?					
<u>Poster Criteria 5</u>	1	2	3	4	5
Is it easy to determine how the UN's SDGs are applicable to the information presented?					
Overall comments:					