**template for Peer Review comments**

**Technical series on synthetic biology**

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| **Contact information** |
| **Surname:** |  |
|  |  |
| **Given Name:** |  |
|  |  |
| **Government** |  |
| **(if applicable):** |  |
|  |  |
| **Organization:** | Korea Biosafety Clearing House (KBCH)Korea Research Institute of Bioscience and Biotechnology (KRIBB) Korea Advanced Institute of Science and Technology (KAIST) |
|  |  |
| **E-mail:** | kbch@kribb.re.kr |
|  |  |
| **Comments on the Technical Series on Synthetic Biology** |
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| General comments | As a scientist studying in the field of synthetic biology, I was happy to review this kind of technical series on synthetic biology. Most of all, I have concerns about the definition and scope of synthetic biology (SB) in the current draft. I think CBD provided the broad definition and scope of SB (page 8, lines 9-12), which makes the lack of certainty about whether SB is a single discipline or multi-disciplines, how SB impacts society, and the environment, and how market value and growth rate of SB are estimated. SB should be distinguished from conventional genetic engineering that has been generating classical GMOs because SB contributes to overcoming the limitations of GMOs. SB has been creating many tools and approaches for innovating conventional genetic engineering, for example, SB has been developing reliable biocontainment methods. Unfortunately, the draft implies that organisms created by SB would have a higher risk than non-GMO or classical GMOs. Overall, a clear definition and scope of SB should be provided in the revised draft. Based on a clear definition of SB, different subjects and methods under the umbrella of SB in the current draft should be reorganized by removing and adding them. |
| 8 | 1-48 | Should mention the benefits of synthetic biology for diversity |
| 9 | 34-49 | An insufficient balance between risk and benefit of synthetic biology |
| 33 | 10 | Geddes et al. ( 2019)recently → Geddes et al. (2019) recently |
| 35 | 27 | Greenhouse and waste gas (CO2, CO, CH3) → Greenhouse and waste gas (CO2, CO, CH4) |
| 40 | 1 | and Lin et al. ( 2020)reviewed → and Lin et al. (2020) reviewed |
| 40 | 3 | levels(Wan et al., 2019). → levels (Wan et al., 2019). |
| 46 | 41 | Should consider biocontainment methods developed by synthetic biology |
| 57-60 | All | This section fails to distinguish synthetic biology from conventional genetic engineering in terms of GMO development |
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| General comments | Synthetic Biology TS No. 82 update draft deals with and well explains the vast contents of synthetic biology, but the following technologies need to be considered with more details: High-throughput (e.g., Next Generation Sequencing), Bioinformatics (computational biology), and fluid dynamics. With regard to NGS, DNA synthesis and improvement are accompanied by the advances in DNA decoding technology. Also, Bioinformatics systemizes complex and vast amount of biological information, while enabling big data collection and AI applications. Finally, the control of Microfluid enables a single cell at the nanoscale to be controlled, which drives the development of synthetic biology. The need for a regulatory governance for the development of synthetic biology should be more emphasized. Chapter D addressed the potential impacts of synthetic biology, but the actual contents are mainly focusing on the ‘concerns’ of synthetic biology. It would be recommended to include more positive impacts of synthetic biology, such as industrial and economic influences through technological innovation by Gingko or Moderna company, development of new genetic resources and accumulation of rapid scientific knowledge through the projects of YG 2.0 or GP-write etc., and survival of organisms in the extreme environment or in the space like NASA’s Cubes.  |
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| 8 | 17-19 | This three-way categorization of synthetic biology applications is useful from the perspective of researchers and industrialists, but it still needs to be further refined. For example, what does it mean by “contained”? Does it mean “managed”? Or “manageable”? Then, does “unmanaged” or “semi-manged” mean “uncontained”? Also, it is questionable whether the distinction between urban/rural settings is necessary here. (Consider also the part on page 29, line 11 and thereafter)  |
| 8 | 38- | Fragmented landscape at the international level – This is an important issue to be addressed. I am glad that the report has pointed that out.  |
| 9 | 8-  | “integrating the scientific freedom . . .” with what? This sentence looks incomplete. At the same time, the juxtaposition of scientific freedom and responsible research can give an illusive getaway without a wide-ranging discussion of what constitutes responsible research how to achieve it. We have to be reminded of somewhat disappointing inputs from the Human Genome Project’s ELSI initiatives. |
| 10 | 10- | The expression, “essentially ubiquitous,” looks too strong and deterministic. It has to be toned down and made humble. |
| 40 | 5- | Would it be possible to provide reasons why certain applications of synthetic biology have remained in early stages of R&D? Because of technical difficulties? Lack of funding? Too much regulation? |
| 64 | 41- | The concept of “anticipatory framework” and the solution by “political will” are here suggested without much elaboration. In other words, do the current debates and concerns stem from the lack of this kind of framework and a certain political will? Perhaps rephrasing some sentences is needed to avoid any misunderstanding. |
| 72 | 8- | It will be desirable to provide some examples of “Human Practices” done in i-GEM |
| 130 | 4- | It is true that relatively little “real world” data has been collected. I agree that, because of this situation, “any potential benefits of each application should, by necessity, be considered on a case-by-case basis.” Yet, this paragraph does not really address the issues related to risk assessment. The lack of “real world” data is essentially the reason why CBD has embraced the precautionary principle in the first place. It is desirable to have a few sentences to deal with this point.  |
| 131 | 13 | Good examples of how civilian initiated projects can make a difference in dealing with the engagement issues. Perhaps the concept of “Global Observatory” on genome editing, suggested and pursued by a group of scholars, including Professor Sheila Jasanoff at Harvard Kennedy School, can be added to the list.  |
| 132 | 31- | This kind of phrasing gene drive issues – the responsibility frame of doing it now or waiting it for later – is not persuasive. It looks too deterministic (following technological determinism) and too simplistic (without considering other options). It is important to acknowledge the complexity of this contentious issues and lay out as long as possible options.  |

Please submit your comments to secretariat@cbd.int.