**template for Peer Review comments**

**Technical series on synthetic biology**

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| **Comments on the Technical Series on Synthetic Biology** | | | |
| **Page #** | **Line #** | **Comment** | |
| 0 | 0 | Although this document is part of a Technical series, thus is should be focusing on a technical and scientific compilation of information, it presents a lot of “opinions” and speculative sentences in the executive summary and key messages that are not suitable for the goal of the document. In addition, the document does not mention in any part Article 19 of CBD (handling of biotechnology and distribution of its benefits) and mentions very briefly the third CBD objective (fair and equitable sharing of benefits from access to genetic resources). All the suggestions below were made to present a more balanced view, which has already been expressed during the SBSTTA-24 discussions and should be reflected in the text. An additional suggestion would be to include a section about “The concentration of R&D of synthetic biology in developed countries and the exploitation of possible mechanisms to promote the access of developing countries to biotechnological research and its benefits to face the global challenges”.  The suggestions of inclusion are in bold text, and the strikethrough text should be excluded. | |
| 8 | 6 | *“As the discipline continues to advance rapidly and expand beyond the confines of the laboratory, ~~the potential of~~ synthetic biology ~~carries hopes and aspirations~~* ***presents potential solutions*** *to address a multitude of global challenges related to food, health and the environment, among others, but also concerns about potential risks including those associated to biodiversity”.* | |
| 8 | 12 | *“As a consequence, the number of applications, especially those that make use of genome editing technology,* ***although not all applications of genome editing fall under synthetic biology,*** *has increased exponentially and has led to advances in plant and animal engineering, personalised medicine, and clinical therapeutics”.* | |
| 8 | 16 | *“Moreover, technologies such as engineered gene drives can now potentially be applied to a wide variety of organisms****, most of them are still in the research phase,*** *as a tool to spread* ***desirable*** *traits throughout a population”.* | |
| 8 | 22 | *“Although synthetic biology is often referred to as a single discipline, the numerous areas of synthetic biology research represent a wide array of potential* ***positive and negative*** *impacts, some of which are complex in nature and as a result, there is ~~a continuing need to acquire further data and knowledge~~* ***need to use the experience with risks assessment and risk management of LMOs, to proceed with a stepwise approach, whereupon data and knowledge collected from experimental phases can inform the next stages of research,*** *to support the discussions about potential impacts”.* | |
| 8 | 24 – 28 | It is not appropriate to affirm that are methodologies or risk assessment science-based that can measure the impact of synthetic biology on socio-economic, moral and ethical aspects.  *“~~The use of synthetic biology triggers a wide variety of views related to risks and benefits, moral and ethical values, along with broader issues such as socio-economic aspects. Therefore, a science-based assessment of any potential impact is seen as part of a wider decision-making activity; one that evaluates such economic, political, moral, and ethical concerns alongside a scientific analysis of the expected or potential changes that would result from using technology~~”.* | |
| 8 | 30 | *“It is also important to stress that due to the diverse nature of the potential impacts, they cannot be generalised for all synthetic biology applications, and they should, by necessity, be considered on a case-by-case basis****, the same principle that is applied to risk assessment of LMO****”.* | |
| 8 | 31 – 33 | *“In this light, as synthetic biology applications approach commercial ~~deployment~~* ***release*** *~~and potential environmental release~~, this is bringing challenges to building consensus on how they are to be regulated, either under the same regimes as ~~classical genetic engineering~~* ***modern biotechnology*** *~~albeit with adaptations, or under new regimes yet to emerge~~*  ***with the necessary adaptations based on existing risk assessment frameworks and experience with risk analysis of different genetically modified organisms along decades****”.* | |
| 8 | 42 – 47 | It is not appropriate to affirm that are methodologies or risk assessment science-based that can measure the impact of synthetic biology on socio-economic, moral and ethical aspects.  *“~~Calls for improved governance of synthetic biology, including addressing gaps in the international legal and regulatory frameworks, place significant emphasis on the need to better address challenges that go beyond the scientific areas, and call to also consider societal, economic, and ethical dimensions. Enhanced regulatory oversight addressing these dimensions appears desirable to promote public trust and acceptance, however, the international laws, processes and initiatives analysed appear ill-equipped to address several of these dimensions~~”.* | |
| 8  9 | 48  1 – 2 | *“With over a decade of substantive decision making addressing synthetic biology,* ***including the decision about the criteria for synthetic biology to be considered a New and Emerging Issue under the agenda, and a topic that could not reach a consensus among Parties,*** *the Convention on Biological Diversity has emerged as an important international forum ~~currently deliberating~~* ***for discussions about possible mechanisms to monitor and assess*** *the potential* ***positive and negative*** *impacts of synthetic biology and ~~its regulation~~, ~~particularly~~ as they relate to biodiversity and biosafety”.* | |
| 9 | 4 – 6 | *“There is a recognised need to first better integrate and coordinate governance of synthetic biology, and secondly~~, to expand the focus of governance beyond the focus on biosafety, human health and the environment to a more holistic approach that also encompasses social impact, ethical principles, and elements of social justice~~* ***to provide for the effective participation of developing countries in biotechnological research, as they provide the genetic resources for such research and to the results and benefits arising from biotechnologies*** *~~in accordance with national circumstances~~.”* | |
| 9 | 3 – 11 | It is not appropriate to expand the focus of governance beyond human health and the environment to a more holistic approach. The risk assessment must be science-based according to SPS Agreement.  *“~~There is a recognised need to first better integrate and coordinate governance of synthetic biology, and secondly, to expand the focus of governance beyond the focus on biosafety, human health and the environment to a more holistic approach that also encompasses social impact, ethical principles, and elements of social justice, in accordance with national circumstances. To avoid unintended irreversible environmental damage and associated geopolitical challenges, innovative research guidelines, governance methods, integration with social sciences, and engagement with communities are needed. As we think about advancing synthetic biology into the future, the challenge is integrating the scientific freedom that allows research and product development to move ahead while acting responsibly and in a manner that embraces ethical, legal, and larger societal values~~”.* | |
| 9 | 29 | *“The current debate also echoes similar views expressed at the emergence of ~~classical genetic engineering~~* ***modern biotechnology*** *where developments were considered inherently risky by some, or not presenting any unique or novel risks by others”.* | |
| 9 | 31 – 33 | *“~~If discussions to date are anything to go by, those likely to fall under regulation will be subject to a thorough analysis of their different potential impacts on biodiversity-related issues as well as cultural, social, ethical and economic considerations~~* ***The deliberation from synthetic biology AHTEG to date considers that all the synthetic biology organisms can be considered to be LMOs and that the risk assessment methodology according with Annex III of the Cartagena Protocol are adequate to assess those organisms****”.* | |
| 9 | 35 | *“The potential of the synthetic biology toolbox is boundless, and so are the opportunities for synthetic biology to have ~~an impact in an unprecedented manner~~* ***positive and negative impacts****”.* | |
| 9 | 49 | *“These are only some of the many examples of synthetic biology applications that are having and could have ~~an impact in an unprecedented manner~~* ***positive and negative impacts****”.* | |
| 10 | 34 | Include in the end of the paragraph: *“****Those numbers of publications reflect how research and development are concentrated on developed countries and the urgent necessity to democratize the access to technology as a global solution for the environmental crisis****”.* | |
| 10 | 44 | *“Currently, of those synthetic biology products that are* ***already submitted to a risk assessment and*** *commercially available and intended for use in semi-managed, managed, or urban settings, there are two genome edited crops, self-limiting insects, and biological nitrogen fertiliser based on engineered bacteria”.* | |
| 10 | 46 | *“It is expected that some other ~~genome edited organisms and potentially those containing engineered gene drives~~* ***synthetic biology organisms synthesized with genome editing or containing engineered gene drive*** *could reach the market in a few years”.* | |
| 11 | 1 | *“~~As only a few synthetic biology applications developed for direct use in the environment have been commercialised, relatively little “real world” data has been collected concerning their potential impacts~~*  ***Only a few synthetic biology applications developed for direct use in the environment have been commercialized and the risk assessment framework for LMOs is being used****”.* | |
| 11 | 5 – 6 | *“The range of potential impacts of synthetic biology applications on the conservation and sustainable use of biodiversity ~~remains largely hypothetical/speculative due to~~*  ***is being assessed using the experience and methodology used for LMOs as those synthetic biology organisms are considered to be LMOs, although*** *the limited number of commercial ~~products~~* ***organisms*** *developed specifically for use in the environment that are currently available”.* | |
| 11 | 8 | *“Thus, the discussions on potential impacts have been informed mostly by previous experience with LMOs ~~and associated concerns~~”.* | |
| 11 | 8 – 10 | *“~~This is bringing challenges to arriving at consensus on whether synthetic biology applications are to be assessed, and regulated under the same regime, which itself is beginning to adapt to these applications~~*  ***There still a speculative view about the challenges for future synthetic biology organisms applications and whether adaptations or reformulations to the current risk assessment frameworks will be necessary****”.* | |
| 11 | 11 – 13 | *“~~Many of the impacts that were originally expected were overly simplistic in nature, with latest experience demonstrating that the situation is far more nuanced and with multiple factors adding to the complexity~~*  ***There are multiple factors to be considered, both positive and negative, for decision-making about synthetic biology applications****”.* | |
| 11 | 24 – 26 | *“This complex web of potential interactions derived from the use of synthetic biology applications in various scenarios is therefore adding to the challenges ~~of assessing the potential impacts that could be associated with their use~~* ***of decision-making about synthetic biology applications****”.* | |
| 11 | 30 – 32 | *“~~Recognising the global nature of synthetic biology applications and the fact that local communities are most likely to be impacted first, it would be advantageous to communicate concepts of new applications prior to large investments of time and resources (e.g. construction, testing and release)~~”.* | |
| 11 | 39 | *“Further, since most research and development of synthetic biology applications occurs in relatively few countries, outreach and engagement with intended recipient communities will be important when considering ~~deployment~~* ***release*** *in other geographical locations, especially as there may be a need for further 39 building of local regulatory capabilities”.* | |
| 11 | 44 – 48 | *“Regulatory decision-making on activities involving synthetic biology products ~~requires more than just a crucially important assessment of characterised risks and potential prescribed risk management strategies, as the degree to which a risk is acceptable is a social construct, as are the guiding policy goals. Neither can be determined purely scientifically and should instead be informed through consultation with a broad set of stakeholders, including the populations likely to be impacted most~~* ***maybe requires, according with national legislation and circumstances, consultations with a broad set of stakeholders, including the population likely to be impacted most, after a science-based risk assessment and management is conducted****”.* | |
| 11 | 48 – 50 | *“~~For emerging technologies, especially synthetic biology, that affect the global commons, there has been a call for concepts and applications to be published in advance of construction, testing, and release~~”.* | |
| 12 | 23 | The sentence lacks the initial words. | |
| 12 | 29 – 31 | *“~~Due to its interdisciplinary nature, s~~***S***ynthetic biology presents particular challenges for the regulatory system as applications of synthetic biology have the potential to accelerate the pace of technological development across multiple sectors, ~~with the promise of~~* ***and*** *helping to solve some of humanities greatest challenges this century”.* | |
| 12 | 34 – 37 | *“Often, international and national regulatory regimes tend to focus on biosafety risks* ***as part of science-based risk assessment*** *~~rather than a more holistic approach~~*  ***while a more holistic approach could be part of a decision-making*** *that takes into account a range of public interest issues related to the biosecurity, ethics, societal, cultural and economic implications of synthetic biology more broadly, as well as potential benefits related to biodiversity conservation and sustainable use* ***and also and the important benefits for human health and food security****”.* | |
| 12 | 37 – 38 | *“~~In this sense, a new paradigm for regulating synthetic biology applications is needed that looks beyond just biosafety~~”.* | |
| 12 | 44 | *“Considering the fast pace of development of synthetic biology, and the challenge for regulatory regimes to cope with potential new applications, an early screening of what is under research and development and their commercialisation perspectives ~~will be critical~~*  ***should be considered due to the potential*** *in providing timely information for countries and organisations to react and adapt if necessary”.* | |
| 13 | 5 – 7 | *“~~This will require a concerted effort from all stakeholders to adapt existing frameworks in order to “future-proof” them for synthetic biology applications~~”.* | |
| 13 | 11 | *“Considering the broad scope of not only synthetic biology research, but also the ~~potential impacts~~* ***positive and negative*** *of its products and applications, it is not surprising that no international treaty framework nor institutions exist with a sufficient mandate to regulate the full spectrum of possible synthetic biology activities or impacts”.* | |
| 13 | 19 – 20 | *“As the primary forum deliberating the governance of synthetic biology applications and products in relation to potential impacts on biodiversity-related issues, the framework of the CBD provides unique opportunities for hosting discussions****,******respecting the competencies of other international fora,*** *aimed at improving coordination and addressing challenges and cooperation opportunities* ***for effective participation of developing countries on biotechnological research,*** *which are apparent in the governance of synthetic biology without the need to invent/create another series of fora”.* | |
| 13 | 25 | *“Therefore, aspects such as coordination, cooperation, capacity-building, knowledge-sharing****, technology transfer*** *and communication are of paramount importance”.* | |
| 13 | 28 | *“The governance of synthetic biology cannot advance if the approach towards it is narrow or if it lacks the support of the various entities and stakeholders who play a key role in its development* ***dissemination****, potential regulation and potential use”.* | |
| 13 | 34 | *“This is further exacerbated by the large number of near-market applications, and as such, there is a growing urgency to discuss the evolution of a more cohesive international regulatory environment* ***and mechanisms for broader participation of developing countries on research and development of biotechnological solutions****”.* | |
| 13 | 38 | *“Moreover, as synthetic biology will continue to grow in 34 relevance and importance due to the opportunities that it offers towards solving global challenges, it is 35 imperative that resources are available concurrently for research and development, and for the 36 development and or adaptation of regulatory systems that could provide the needed safety that should 37 accompany any potential use* ***and distribution of its benefits****”.* | |
| 15 | 11 | Perhaps include other definitions of Synthetic Biology since there is no internationally agreed definition. This might help the Parties come to an agreed definition that will help better define risk assessment and management actions. | |
| 15 | 25 | *“The authors have also attempted to achieve the same degree of inclusivity when presenting the numerous published perspectives concerning individual synthetic biology applications and the sector as a whole.* ***It is also recognized the conclusions of the AHTEG that the current synthetic biology organisms are LMOs and can be assessed using the case-by-case existing methodologies and in this case most of the examples described fall under the definition of LMO of Cartagena****”.* | |
| 17 | 24 | *“Similar to the divergent views on what is considered synthetic biology, there could also be different views on what could be considered a supporting technology or tool. This section provides information on some of the more widely used tools but is not meant to be an exhaustive list****, and is not meant that the use of those tolls will generate a synthetic biology organism****”.* | |
| 17 | 27 | *“Like the term “synthetic biology” under which it may fall, the term “gene drive” is most often used as if it were a single technology, but it is more accurate to consider each as a suite of approaches that can be tailored to the needs of specific applications.”*  It would be useful to have these different approaches that usually fall under the general scope of gene drive as a terminology described and defined. | |
| 41 | 4 – 5 | *“Sustainable use* ***can*** *encompass~~es~~ ecological, economic, social, cultural, and political factors (Glowka et al., 1994)”.* | |
| 41 | 9 | *“Likewise, synthetic biology applications can raise social, economic, and cultural considerations which are equally important for decision-making and governance of the issue* ***if applicable, in a case-by-case basis****”.* | |
| 43 | 32 – 33 | There is not enough scientific evidence for this statement.  *“~~However, recent research indicates that engineered gene drives may face resistance and limited efficacy in wild mosquito populations~~”.* | |
| 44 | 22 – 23 | Delete the end of line 23, that presents an incorrect generalisation. The risk assessment is carried out on a case-by-case basis,  *“Given that organisms containing engineered gene drives can potentially impact biodiversity, national sovereignty and food security, there is a crucial need to develop strategies ~~to minimise~~* ***to evaluate*** *any potential risk, including those of intentional and unintentional spread ~~and to mitigate harm to humans or the environment~~ (de Wit, 2019; DiCarlo et al., 2015; National Academies of Sciences Engineering and Medicine, 2016).* | |
| 44 | 44 | *“Some of the techniques of genome editing (that for some may not fall under synthetic biology; see Scope & Methods) are less precise than others such that additional molecular changes to the intended (i.e. off-target modifications) can also be introduced into the host organism; again, phenomena that have been reported with ~~classical genetic engineering~~* ***modern biotechnology*** *(Eckerstorfer, Heissenberger, et al., 2019)”.* | |
| 46 | 29 – 37 | Delete all the paragraph. Only peer reviewed literature should be used as a reference.  *“~~Potential negative impacts could result from the increased utilisation of biomass for synthetic biology applications. “Biomass” is generally used to refer to the use of “non-fossilised biological and waste materials as a feedstock” (ETC Group, 2011; Jeswani et al., 2020). Additionally, potential negative impacts include the displacement of sustainable uses of biomass, the destruction of native forests and marginal” lands such as deserts and wetlands to provide land to establish plantations for biomass production, and harvesting of biomass from natural grasslands (ETC Group, 2010; Royal Academy of Engineering, 2017). On balance, many anticipate that the potential efficiencies and attendant reduction in reliance on fossil fuels offered by energy production using synthetic biology would offset anticipated risks to the environmental ecosystem as it exists today. But considerable uncertainty remains (ETC Group, 2015)~~”.* | |
| 47 | 17 – 20 | Delete from line 17 to line 20. Only peer reviewed literature should be used as a reference.  *“~~Additional examples from Section 3 include the production of recombinant Factor C (rFC) from synthetic horseshoe crab blood, synthetic rhinoceros horns and squalene, each of which could reduce or remove the need to exploit wild species (ETC Group, 2013; Woodrow Wilson International Center for Scholars, 2012)~~”.* | |
| 47 | 31 – 36 | Delete from line 31 to line 36. Only peer reviewed literature should be used as a reference.  *“~~One case where real-life experience has been gained concerns vanillin. Initially, the production of vanillin by synthetic biology (Section 3.3.1(d)) arose concerns that its large-scale production could negatively impact the many smallholder farmers involved in the production of cured vanilla beans (ETC Group, 2013). Vanilla orchids are commonly produced by inter-cropping with rainforest trees as ‘tutors’ for vanilla vines to grow on, and so it was thought that reduced demand for the natural product could disrupt this agro- ecological method of cultivation (ETC Group, 2013)~~”.* | |
| 47 | 46 – 47 | “*The use of synthetic biology triggers a wide variety of views related to perceptions of risks and benefits, moral and ethical values, along with broader issues such as socio-economic aspects.* ***Risk assessment is a science-based procedure to estimate the risks and to define risk management strategies while the decision-making can consider other factors, according with national legislations and circumstances.*** *~~A science-based assessment of impacts is therefore seen as part of a wider decision-making activity; one that evaluates such economic, political, moral and ethical concerns alongside scientific predictions of changes that would result from using technology~~*”. | |
| 48 | 1 | *“****Voluntary*** *~~G~~****g****uidance ~~on the process for assessing such concerns has recently emerged~~* ***about socio economic considerations is available*** *(Secretariat of the Convention on Biological Diversity, 2018), especially with regard to the value of biological diversity to indigenous peoples and local communities”.* | |
| 48 | 41 | *“Society as a whole therefore has a key role to play in helping decision-makers and regulators better define specific protection goals (or “assessment endpoints”) ~~i.e. the things that society doesn’t want harmed (Section 6.)~~, that then dictates the characteristics of new products or technologies from synthetic biology to be assessed both scientifically (Craig et al., 2017) and socio-economically (Secretariat of the Convention on Biological Diversity, 2018)”.*  This is not a valid and global concept of protection goals. | |
| 51 | 36 – 40 | Delete from line 36 to line 40. Only peer reviewed literature should be used as a reference.  *“~~The displacement of some of the natural products (i.e. naturally occurring molecules obtained from plants) can potentially ease negative pressures on wild or cultivated species, but it can also displace cultivation practices, often in topical and sub-tropical regions. If not handled sensitively, this therefore may bring them into conflict with, or displace, those naturally sourced products which underpin the livelihoods and fragile economies of smallholder producers (ETC Group, 2016; ETC Group & Fibershed, 2018; UNCTAD, 2019)~~”.* | |
| 53 | 14 – 16 | *“~~Civil society groups strongly critique the way that IP regimes have been used in agricultural biotechnology to concentrate power with a few corporations, and they see similar patterns of use occurring in synthetic biology (ICSWGSB, 2011; ETC Group, 2010; Friends of the Earth, 2010)~~”.* | |
| 57 | 3 – 6 | *“~~Different methods and techniques of synthetic biology may need different forms and levels of oversight. Thus, any new risk assessments, cost-benefit analyses and regulations must flexibly encompass different applications, uses and products (ETC Group, 2012)~~”.* | |
| 60 | 24 | *“In the meantime, Brazil, New Zealand, and Australia have approved RNAi-based GM plant events for environmental and food/feed commercialisation without any changes or adaptations in their* ***case-by-case*** *risk assessment procedure* ***but with different risk hypothesis informed in data collected****”* | |
| 66 | 20 – 22 | Delete the sentence from line 20 to line 22. The corn variety mentioned was not developed through synthetic biology. Genome edition in this case is similar to modifications achieved by conventional breeding or by spontaneous mutations.  *“~~In 2018, Brazil ruled that Corteva’s ‘waxy corn’ developed through the use of genome editing was not an LMO, thus exempting the product from biosafety regulations (Comissão Técnica Nacional de Biossegurança, 2018)~~”.* | |
| 66 | 45 – 47 | *“~~Likewise, Brazil’s National Technical Biosafety Commission determined in 2018 that gene-edited hornless cows are conventional animals and that these cows and their products can enter the market (Genetic Literacy Project, 2020)~~”.*  The decision that concluded the gene edited hornless cows would not be a genetic modified organism ([Technical Opinion Nº 6.125/2018](https://www.in.gov.br/materia/-/asset_publisher/Kujrw0TZC2Mb/content/id/48447747/do1-2018-11-05-extrato-de-parecer-tecnico-n-6-125-2018-48447599)) was cancelled in June 2019 (<https://www.in.gov.br/web/dou/-/despacho-de-13-de-junho-de-2019-163601357>). | |
| 70 | 17 – 19 | Delete from line 17 to line 19. Only peer reviewed literature should be used as a reference.  *“~~After Asilomar, precautions for rDNA experiments gradually relaxed thereby laying the foundations for many of the technologies which underpin synthetic biology today. This relaxation has been attributed to the low incidence of accidents (Schmidt and Lorenzo 2010) and a “culture of safety” (Erickson et al., 2011) involving rDNA despite its increased use. Critics of self-regulation see the Asilomar Declaration as a strategic move to pre-empt greater government oversight and narrow the focus of concern (ETC Group, 2007)”.~~* | |
| 70 | 46 – 47 | Delete from line 46 to line 47. Only peer reviewed literature should be used as a reference.  “*~~The ETC Group (2007), on the other hand, suggested that there was internal disagreement over whether or not to boycott non-compliant gene synthesis companies~~*”. | |
| 73 | 25 – 26 | Delete from line 25 to line 28. Only peer reviewed literature should be used as a reference.  *“~~Although ultimately abandoned, NGOs and commentators expressed concern at the breadth of its sweeping claims (Calvert, 2012; ETC Group, 2007, 2011) particularly in relation to creation of synthetic organisms for the production of biofuels like ethanol and hydrogen (van den Belt, 2013)~~”.* | |
| 73 | 44 – 48 | Delete from line 44 to line 48. Only peer reviewed literature should be used as a reference.  *“~~In the USA, each patent application costs $10,000 (Henkel & Maurer, 2007). If patenting becomes established as the necessary method of claiming of IP rights on synthetic biology, the high cost could influence the kinds of applications of synthetic biology that are pursued (high profit applications targeting wealthy populations), as well as the types of organisations (continuing concentration of ownership and control in large transnational corporations) (ICSWGSB, 2011; ETC Group, 2007; Redford et al., 2013)~~”.* | |
| 73  74 | 50 – 51  1 | Delete the sentence from line 50 of page 73 to line 1 of page 74. Only peer reviewed literature should be used as a reference.  *“~~A strong concern of civil society groups is that strong IP regimes could also restrict access to information for carrying out independent, effective risk assessments~~”.* | |
| 133 | 8 | “*In contrast, a change since 2015 is the availability of commercial products for use directly in the environment, including genome edited soya bean, engineered bacteria fertilisers and self-limiting insects****, although due to the broad definition of synthetic biology adopted by CBD many of the products described are LMOs***”. | |
| 133 | 35 | *“A common feature of articles identifying gaps or deficiencies in the governance of synthetic biology focus on the operation of international regimes as silos and the need to firstly better integrate/coordinate governance of synthetic biology and secondly, to expand the focus of the governance beyond human health and the environment to a more holistic approach that also encompasses social impact, ethical principles, and elements of social justice****, if required by national legislation as those elements can be part of decision-making****”.* | |
| 134 | 32 – 34 | “*To avoid unintended irreversible environmental damage and their associated geopolitical threats, ~~innovative research guidelines, governance methods, integration with social sciences~~* ***capacity building, information and knowledge-sharing, technology transfer, risk assessors training, and integration with academia****, and engagement with communities are needed*”. | |
| 134 | 39 – 43 | “*~~Calls for improved governance of synthetic biology, including addressing gaps in the international legal and regulatory frameworks, place significant emphasis on the need to better address societal, economic, and ethical dimensions. Enhanced regulatory oversight addressing these dimensions appears desirable to promote public trust and acceptance, however, the international laws, processes and initiatives analysed appear ill-equipped to address several of these dimensions~~”*. | |