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Inhalt

Better Safe than Sorry: Human Rights Obligations for the Prevention of Pandemics*

For more than a year, the Covid-19 pandemic has had the world firmly in its grip. Although its origins remain unclear, the scenarios currently discussed have one thing in common: the pandemic can be traced back to human activities posing a health risk. In view of the threat of future pandemics, the question arises in which way States are obliged to prevent the occurrence of a pandemic, in particular by regulating private action. This question will be analysed from a human rights perspective with a special focus on the right to health as enshrined in Article 12 of the International Covenant on Economic, Social and Cultural Rights [ICESCR]. It is generally recognised that Article 12 entails a duty to protect. This duty is not limited to preparing for the event of a pandemic by providing medical care, but also requires mitigating or avoiding risks that could lead to the emergence of a pandemic. Special difficulties regarding the content of this duty to protect arise when the probability of health damages cannot be clearly determined due to scientific uncertainty. According to our view, the right to health has to be interpreted in the light of a precautionary approach. It follows that scientific uncertainty does not justify the omission of State regulation if there is a risk of potentially irreversible health damages. At the same time, due to the high threshold for the application of the precautionary approach, this approach allows to adequately take into account other relevant human rights.

A. Introduction

On 31 December 2019, China informed the World Health Organisation [WHO] of "cases of pneumonia of unknown cause" on its territory but saw then "no evidence of significant human-to-human transmission".[1] What began as a sidenote in world-wide news went on to drastically change the lives of many across the globe for a long time. On 11 March 2020, the WHO declared the outbreak of a pandemic – the first pandemic caused by a coronavirus.[2] Over a year later, the Covid-19 pandemic still holds the world firmly in its grip and has left more than 4,3 million people dead.[3]

One of the many questions still left unanswered is that of the origin of the virus. The prevailing hypothesis seems to be that the virus may have naturally transmitted from a bat to a human, either directly or via the intermediary of another animal, probably originating in a wild animal market in Wuhan.[4]

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1 *WHO*, Pneumonia of unknown cause – China (05.01.2020), available at https://www.who.int/emergencies/disease-outbreak-news/item/2020-DON229.

2 *WHO*, WHO Director-General's Opening Remarks at the Media Briefing on COVID-19 (11.03.2020), available at https://www.who.int/director-general/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020.

3 *WHO*, Weekly operational update on COVID-19 (16.08.2021), available at https://www.who.int/publications/m/item/weekly-operational-update-on-covid-19---16-august-2021.

4 *WHO*, 'WHO-convened Global Study of Origins of SARS-CoV-2: China Part', Joint WHO-China Study (last updated 06.04.2021), available at https://www.who.int/publications/i/item/who-convened-global-study-of-origins-of-sars-cov-2-china-part, 113–116, assessing the likelihood of these scenarios as possible to likely or likely to very likely, respectively, while recommending further investigation.

In early 2020 and again more recently, another theory was also proposed: that of a laboratory leak.[5] Given the lack of a secure factual and scientific basis, this article will not attempt to assess which international obligations regarding the prevention of the Covid-19 pandemic would have existed and, if any, were violated. Nevertheless, the discussion leads to the question in which way States are obliged to govern private activities posing a risk as the possible source of a pandemic – when, for example, a virus escapes from a laboratory not run or effectively controlled by a State or when it jumps from a non-human animal to a human in another private context. In view of future pandemics, the focus of the present analysis will thus lie on possible regulation of private activities that are not attributable to the State under Articles 5 to 11 of the Articles on the Responsibility of States for Internationally Wrongful Acts [ARSIWA].[6]

After defining the crucial notion of "risk" and "scientific uncertainty" used in the following (B.), we will outline that there are no specific rules on obligations of prevention through regulation of private activities at the international level (C.). The question is whether an obligation to prevent the emergence of a pandemic can be derived from general rules of international law. We will try to identify possible sources of such preventive obligations and give some thoughts on their possible content. The human right to health and the ensuing obligation of States to adopt preventive measures for the protection of this right will be the key point of our analysis (D.). Given that the risk of health damages is often characterised by scientific uncertainty, we will then address the possible relevance of the precautionary principle in the human rights context (E.).

B. Basic notions

I. Notion of "risk"

The focus of this paper lies on the regulation of private activities posing a risk. There are different meanings of "risk" and there is no commonly accepted definition in public international law. It is unclear, in particular, whether and how a "risk" is different from a "threat," a "danger" or a "hazard".[7] We will rely on the following broad definition: a risk is an unwanted event that may or may not occur, i.e. an unwanted hypothetical future event.[8] By contrast to a quantitative notion, this broader definition includes situations of uncertainty where no probabilities can be assigned for the occurrence of damage.[9]

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5 It is suggested that the pandemic originated by accidental release of the virus from the Wuhan Institute of Virology. The WHO's initiative for a second phase of investigation on the origin of the virus in China including this hypothesis has been refused by Chinese officials. China stressed the alternative hypothesis that the virus may have entered its territory in food shipments or that the virus may have jumped to humans outside China altogether. See *WHO*, 'WHO-convened Global Study of Origins of SARS-CoV-2: China Part' (note 4), 119–120, where this scenario was considered to be extremely unlikely, not recommending further investigation. A member of the joint investigation group has recently suggested that this was the result of a deal with the Chinese officials that were part of the group, see *Böge*, 'Welche Rolle spielten Wuhans Labore?', in: FAZ (13.08.2021), available at https://www.faz.net/aktuell/gesellschaft/gesundheit/coronavirus/welche-rolle-spielten-labore-in-wuhan-bei-der-ausbreitung-der-pandemie-17484246.html.

6 *ILC,* Materials on the Responsibility of States for Internationally Wrongful Acts, ST/LEG/SER.B/25 (2012) [ARSIWA].

7 *Voeneky*, Human Rights and Legitimate Governance of Existential and Global Catastrophic Risks, in: Voeneky/Neuman (eds.), Human Rights, Democracy, and Legitimacy in a World of Disorder (2018), 139 (140).

8 *Hansson*, 'Risk', in: Zalta (ed), Stanford Encyclopedia of Philosophy, available at https://plato.stanford.edu/entries/risk/.

9 For details on the notion of risk, see *Voeneky*, in: Voeneky/Neuman (eds.) (2018) (note 7), 140 *et seq.*

II. Notion of "scientific uncertainty"

The particular difficulty of the prevention of pandemics is the scientific uncertainty that surrounds their emergence. In the following, we shall use the notion of "scientific uncertainty" to signify both cases of insufficient determination of the probability of occurrence of a damage, as well as knowledge deficits regarding cause-effect relationships. Considering this qualitative notion explained above, the concept of risk overlaps with the notion of "scientific uncertainty" as used in the following.[10] The uncertainty has to be scientific, i. e. it has to relate to scientific methods and analytics. An instance of this would be e.g. incomplete data or the impossibility to design a forecast model.[11]

C. The Specific Framework of International Obligations Relating to Pandemics

The provisions of the WHO,[12] in particular the International Health Regulations [IHR] adopted under Article 21 WHO Constitution,[13] contain specific rules with regard to pandemics.[14] They are therefore an initial basis for assessing what obligations States have to prevent a pandemic. One can identify two phases in the emergence of a pandemic: a first phase in which a pathogen first infects humans, and a second in which the disease spreads and a pandemic is caused. As can be seen from the three categories into which the obligations under the IHR can broadly be divided, preventive measures within this system primarily concern the second phase, that is the spread of a health risk rather than its emergence as such.

The *first* category of obligations under the IHR comprises obligations regarding the existence of a health care system. States must develop and maintain the "capacity to detect, assess, notify and report events" under the Regulations[15] as well as the "capacity to respond promptly and effectively to public health risks and public health emergencies of international concern",[16] including through international collaboration and assistance.[17] These obligations exist not for the sake of prevention *per se*, but focus on the management of events in a particular State when diseases have already reached the population.

The *second* category includes the obligation to inform the WHO and thus – via the WHO – other States of events which may qualify as a "public health emergency of international concern."[18] Following the initial notification, further information must be provided throughout the time of existence of the threat to public health.

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10 For a different opinion, emphasizing the need to separate "risk" from "scientific uncertainty", cf. Viñuales, Legal Techniques for Dealing with Scientific Uncertainty in Environmental Law, Vanderbilt Journal of Transnational Law 42 (2010), 437, 439, with reference to *Knight*, Risk, Uncertainty and Profit (1921).

11 For a further differentiation between uncertainty within science and uncertainty at the limits of science, cf. *Peel*, The Precautionary Principle in Practice, 2005, pp 35 *et seq*.

12 Constitution of the World Health Organisation (adopted on 22.07.1946, entered into force on 07.04.1948) 14 UNTS 185, available at https://apps.who.int/gb/bd/PDF/bd47/EN/constitution-en.pdf?ua=1 [WHO Constitution].

13 *WHO*, International Health Regulations (2nd edition, 2005), available at http://apps.who.int/iris/bitstream/handle/10665/43883/9789241580410_eng.pdf;jsessionid=06D69645984E39F0F8713D57CA246759?sequence=1 [IHR].

14 For a comprehensive analysis see *von Bogdandy/Villareal*, 'International Law on Pandemic Response: A first stocktaking in light of the coronavirus', MPIL Research Paper Series No. 2020-07 (26.03.2020), available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3561650#.

15 Article 5 (1) IHR.

16 Article 13 (1) IHR.

17 Article 44 IHR.

18 Articles 6 (1) und (2), 7 IHR.

As specified by the definition in Article 1 (i) IHR, a "public health emergency of international concern" qualifies as such because it constitutes a "public health risk to other States through the international spread of disease." The focus of the IHR is therefore (again) not to prevent health risks as such, but to contain risks that have already materialised at the national level. The IHR are mainly concerned with the international spreading of disease. This is further corroborated by the *third* category of obligations under the IHR, focused on measures regarding trade and travel in its Parts IV to VII.

The IHR are, however, not a self-contained regime regarding pandemics. This is explicitly provided in Article 57 (1) IHR which holds that the IHR shall not affect the rights and obligations of any State Party deriving from other international agreements. Since obligations under the IHR focus on the detection and containment of existing health risks and threats to the national level, we shall therefore turn to international human rights law to assess possible obligations to prevent the emergence of such risks.[19] If possible, health risks should be prevented from the outset and not (merely) minimised and managed after having materialised.[20] When speaking of the prevention of a pandemic in the following, we therefore refer to the prevention of health risks through pathogens which have the potential of causing a pandemic. Such action must lie before the first phase of the emergence of a pandemic identified above.

D. The Right to Health and the Obligation to Adopt Preventive Measures

The right to health is protected by various human rights instruments[21] among which are the International Covenant on Economic, Social and Cultural Rights [ICESCR][22] and the International Covenant on Civil and Political Rights [ICCPR][23]. While Article 12 ICESCR establishes the right to health *expressis verbis*, the ICCPR falls short of a similar provision. It is generally recognised, however, that the right to health forms a necessary part of the right to life established by Article 6 (1) ICCPR *vis à vis* life-threatening diseases.[24] To a great extent, the same considerations apply to both provisions.[25] This is

19 Note: the pathogenic agents at the origin of a pandemic may also qualify as biological agents under the Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on their Destruction (adopted 10.04.1972, entered into force 26.03.1975) 1015 UNTS 163 [BWC]. In the following, we shall focus on peaceful research and leave the special obligations under the BWC to the side.

20 A similar claim for a "deep prevention" of pandemics is advanced by Viñuales et al. in the context of the proposal for a global pandemic treaty of the European Council, cf. *Viñuales et al.*, A global pandemic treaty should aim for deep prevention, The Lancet 397 (2021), 1791 (1791–1792). By contrast, the Independent Panel on Pandemic Preparedness and Response rather places an emphasis on damage minimization and containment after an outbreak, see *Independent Panel on Pandemic Preparedness and Response*, COVID-19: Make it the Last Pandemic, May 2021, https://theindependentpanel.org/mainreport/, 60. On both approaches, cf. *Villareal*, Pandemic Risk and International Law: Foundations for Proactive Obligations in: Cubie/ Hesselman/Telesetsky (eds), Yearbook of International Disaster Law Vol. 3 (2020, forthcoming), 2 and 7.

21 *Marks*, The Emergence and Scope of the Human Right to Health, in: Zuniga et al. (eds), Advancing the Human Right to Health (2013), 8.

22 International Covenant on Economic, Social and Cultural Rights (adopted 16.12.1966, entered into force 06.01.1976) 993 UNTS 3 [ICESCR].

23 International Covenant on Civil and Political Rights (adopted 16.12.1966, entered into force 23.03.1976) 999 UNTS 171 [ICCPR].

24 *UN HRC*, General Comment No. 36 (2019) Article 6: Right to Life (03.09.2019), CCPR/C/GC/36, available at https://tbinternet.ohchr.org/_layouts/15/treatybodyexternal/Download.aspx?symbolno=CCPR/C/GC/36&Lang=en, para. 26; for a discussion on the status of the General Comments cf. below.

25 The differences between both treaties concern, first, their State parties, which significantly overlap but are not the same. The US, for example, are not a party to the ICESCR while China is not a party to the ICCPR. A second difference is that the ICESCR's territorial scope of application is not limited by a jurisdiction clause comparable to the one

especially true for the rather abstract, underlying question how human rights provisions are to be interpreted and how their scope is to be concretised.

I. Obligations to Adopt Preventive Measures pursuant to Article 12 ICESCR

Article 12 (1) ICESCR establishes the right to health. This does not equal a right to be healthy.[26] It rather guarantees the right to the best possible standard of health as well as its equal availability and accessibility according to the circumstances of the individual and the possibilities of the State.[27] Article 12 (1) ICESCR thus requires the progressive realisation of the right to health. This very broad provision is further specified by its paragraph (2), that lists areas in which States must necessarily act to realise the right under paragraph (1). According to Article 12 (2) (c) ICESCR, this includes an obligation to take the "necessary measures [...] for the *prevention*, treatment and control of epidemic [...] diseases"[28]. Although pandemics – which differ from epidemics in that they are not confined to a certain geographic area – are not explicitly mentioned, the non-exhaustive nature of paragraph 2[29] and an argument *a majore ad minus* argue for the application of this obligation to pandemics.[30]

It can thus be derived from Article 12 (2) (c) ICESCR that the right to health pursuant to the ICESCR entails an obligation for the State Parties to govern pandemics through the adoption of all "necessary measures." This obligation arises already in the run-up to the outbreak of the pandemic as Article 12 (2) (c) ICESCR explicitly refers to preventive measures. The question under which circumstances such an obligation arises and whether it comprises the regulation of private activities is, however, open to interpretation.

For a coherent interpretation, it is first crucial to remember that all human rights obligations are threefold in that they comprise an obligation to respect, an obligation to protect and an obligation to fulfil.[31] To determine under which circumstances and which preventive measures regarding pandemics must be adopted under Article 12 (2) (c) ICESCR, the focus lies on the obligation to protect, and not on the obligations to respect and to fulfil.

Indeed, in general, the obligation to respect requires States to refrain from interfering directly or indirectly with the enjoyment of the human right.[32] This dimension, by its nature, relates more to the

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contained in the ICCPR, cf. Article 2 (1) ICCPR and *Coomans*, The Extraterritorial Scope of the International Covenant on Economic, Social and Cultural Rights in the Work of the United Nations Committee on Economic, Social and Cultural Rights, Human Rights Law Review 11 (2011), 1 *et seq.*

26 *UN CESCR*, General Comment No. 14 (2000) The Right to the Highest Attainable Standard of Health (Article 12 of the International Covenant on Economic, Social and Cultural Rights) (11.08.2000), E/C.12/2000/4, available at https://undocs.org/en/E/C.12/2000/4, para. 8.

27 *UN CESCR*, General Comment No. 14 (2000) (note 26), para. 9.

28 Emphasis added.

29 *UN CESCR*, General Comment No. 14 (2000) (note 26), paras 7, 13.

30 See for the same result *Wissenschaftlicher Dienst des Deutschen Bundestages*, Die Corona-Pandemie im Lichte des Völkerrechts (Teil 2) – Völkerrechtliche Pflichten der Staaten und die Rolle der Weltgesundheitsorganisation, WD 2 – 3000 – 038/20 (02.07.2020), available at https://www.bundestag.de/resource/blob/708058/baa77392dc14d0dbdb99678cd9aaf69a/WD-2-038-20-pdf-data.pdf, 36.

31 It is now recognised that the tripartite obligation applies to both the ICCPR and the ICESCR. This stands in contrast to the view held particularly during the cold war, that civil and political rights primarily protect against interference by a State, while economic, social and cultural rights impose measures on the State, see *Saul/Kinley/Mowbray*, ICESCR Commentary (1st ed. 2014) 1.

32 *UN CESCR*, General Comment No. 14 (2000) (note 26), para. 33.

aspect of the "treatment" of the pandemic under Article 12 (2) (c) ICESCR. It prohibits a State, *inter alia*, from arbitrarily withholding access to health services.

The obligation to fulfil includes, in addition to certain core obligations, the obligation to work progressively towards the realisation of the right through the adoption of appropriate measures of legislative, administrative, and other nature.[33] It obliges States to create an adequate system of prevention and health care.[34] As for the prevention of a pandemic, "necessary measures" may contain the implementation of an appropriate infrastructure to collect and assess health data as well as the establishment of appropriate education programmes and the implementation of strategies of infectious disease control.[35] The obligation to fulfil therefore includes preventive aspects, but it does not answer the question if and how a State is obliged to act towards private conduct that poses risks or threats for the health of individuals.

Under the obligation to protect, for its part, States must prevent third parties from interfering with the human right in question.[36] The appropriate measures can be taken at the legislative, administrative, or judicial level.[37] Measures adopted at the legislative level must be effective.[38] As such, the obligation to protect certainly applies in cases in which the access to health care is provided by private parties and not by the State itself. The private parties' influence on the realisation of the right to health is crucial and the State must ensure, if necessary through appropriate regulation, that the access to health care is not arbitrarily denied.[39]

The obligation to protect applies not only to situations in which private parties stand in the way of the realisation of the right to health of persons, but also if their conduct is in itself detrimental to the health of individuals or puts it at risk.[40] It therefore only seems plausible that the obligation to protect may oblige States to enact regulation to prevent harmful conduct by private parties. The exact scope of the obligation in relation to the prevention of pandemics remains unclear. It has been concretised neither by jurisprudence nor by General Comment No. 14 [GC No. 14].[41] It is therefore necessary to rely on the general conception of the obligation to protect as well as on the considerations of GC No. 14. The content of regulation of private conduct could span from public information and risk assessments to the prescription of safety measures and potentially the prohibition of certain conducts. The key elements of such a regulation would have to remain within the limits set by Articles 4 and 5 ICESCR.

In practice, under these circumstances, the content of the obligation to protect for the prevention of pandemics remains difficult to determine. In effect, a State could justify potentially extensive regulatory measures if the conduct of private parties poses a threat – as opposed to a mere risk. This limitation is not *per se* called into question by the fact that States also have an obligation of due diligence in fulfilling their human rights obligations. Obligations of due diligence are secondary in nature. They are

33 *UN CESCR*, General Comment No. 14 (2000) (note 26), paras 33, 43.
34 *UN CESCR*, General Comment No. 14 (2000) (note 26), paras 11, 12.
35 *UN CESCR*, General Comment No. 14 (2000) (note 26), para. 16. While the Comment lists these measures as ones of the *control* of infectious diseases, they are, in practice, ones of prevention as well.
36 *UN CESCR*, General Comment No. 14 (2000) (note 26), para. 33.
37 *Krajewski*, The State Duty to Protect against Human Rights Violations through Transnational Business Activities, Deakin Law Review, 23 (2018), 14 (18).
38 *Krajewski* (2018) (note 37), 19.
39 *UN CESCR*, General Comment No. 14 (2000) (note 26), para. 35.
40 *UN CESCR*, General Comment No. 14 (2000) (note 26), paras 35, 51.
41 For a discussion on the status of the General Comments cf. below.

accessory to the primary human rights obligations in that they require the States to fulfil their – primary – human rights obligations diligently.[42] As for the right to health, the obligation of due diligence would thus only apply to situations in which a certain conduct could foreseeably lead to a threat, i.e. when the State knew or should have known of the potential harm.[43]

One will, however, hardly ever be able to conclude that a certain conduct – such as the running of a wild animal market or of a BSL 3 or BSL 4 laboratory[44], even if gain of function research of concern takes place[45] – will meet this threshold. At most, the risk is identified, but its realisation is uncertain both in terms of its occurrence and its extent. This makes the justification of extensive regulatory measures under the right to health more difficult because such measures will necessarily infringe on other human rights of the private parties addressed by them, such as their right to research. Regarding the prevention of a pandemic, the mere application of the dimensions of the right to health is therefore not sufficient.[46] The question remains whether the obligation to protect also applies in cases of scientific uncertainty regarding the potential health risks.

II. Obligations to Adopt Preventive Measures pursuant to Article 6 (1) ICCPR

The ICCPR contains no specific provision on the protection of the human right to health. At least in scenarios of life-threatening health risks such as during a pandemic, however, the right to health is inherent to the right to life enshrined in Article 6 (1) ICCPR.[47] The right to life itself is also governed by the three dimensions of an obligation to respect, an obligation to protect and an obligation to fulfil. During a pandemic, the obligation to protect certainly entails the State's obligation to respond immediately to prevent, stop and mitigate the spread of the disease.[48] And while the obligation to protect under the right to life would also contain similar obligations for a State to regulate harmful private conduct as under the right to health, they would equally seem limited to situations in which the occurrence of harm is certain or at least reasonably foreseeable.

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42 *Monnheimer*, Due Dilligence Obligations in International Human Rights Law (2021) 97.

43 For a similar definition of foreseeability cf. *Monnheimer* (note 42) 117.

44 Biosafety Levels are used to classify which biocontainment precautions are to be adopted to isolate biological agents. BSL-3 generally relates to work with biological agents that can cause serious and potentially lethal disease via the inhalation route, while BSL-related to biological agents with the same potential effects through aerosols. For a definition of the different levels cf. e.g. *World Health Organisation*, Laboratory biosafety manual (3rd edn. 2004), available at https://www.who.int/csr/resources/publications/biosafety/Biosafety7.pdf.

45 The notion of gain of function research refers to experiments in which the pathogenic effects of a microorganism are increased either directly or by increasing its transmissibility or by adapting it to new host organisms, *German Ethics Council*, Biosecurity – Freedom and Responsibility of Research (07.05.2014), available at https://www.ethikrat.org/fileadmin/Publikationen/Stellungnahmen/englisch/opinion-biosecurity.pdf, 214.

46 Furthermore, the need to cooperate amongst States has been emphasised during the pandemic and it is debated whether human rights entail corresponding inter-State obligations. Existing obligations towards individuals, such as the obligation to inform, would then also exist towards the international community. In this regard, however, the IHR provide clearer guidance. In any event, no additional obligations to regulate private conduct would arise. Cf. on the question of inter-State obligations under human rights generally *Alston/Quinn*, The Nature and Scope of States Parties' Obligations under the International Covenant on Economic, Social and Cultural Rights, Human Rights Quarterly 9 (1987), 156 (188 *et seq.*) and General Comment No. 14 (2000) (note 26), para. 48.

47 *UN HRC*, General Comment No. 36 (2019) (note 24), para. 26.

48 See *Wissenschaftlicher Dienst des Deutschen Bundestages* (02.07.2020) (note 30), 31; *Coco/de Souza Dias*, Part I: Due Dilligence and Covid-19: States' Duties to Prevent and Halt the Coronavirus Outbreak, EJIL:Talk! (24.03.2020), https://www.ejiltalk.org/part-i-due-diligence-and-covid-19-states-duties-to-prevent-and-halt-the-coronavirus-outbreak/; on prevention *Joseph*, International Human Rights Law and the Response to the Covid-19 Pandemic, Journal of International Humanitarian Legal Studies 11 (2020), 249 (251).

E. Content of the Obligation to Protect in Situations of Scientific Uncertainty

Special difficulties regarding the content of the obligation to protect arise if the probability and extent of health damages cannot be clearly determined due to scientific uncertainty. While actions by private parties that are clearly or reasonably foreseeably harmful to the health of an individual would have to be contained by the State, this is less clear in the case of risks that are not quantifiable. The fundamental problem of how to deal with scientific uncertainty in the face of potentially widespread and, in particular, irreversible damage is known from the field of international environmental law. There it is addressed by the precautionary principle. Following a brief description of this principle (I.), we will consider to what extent the approach underlying the precautionary principle can be used for an interpretation in the field of human rights law (II.).

I. The Precautionary Principle

In the international context, the precautionary principle has emerged in international environmental law.[49] It has found expression in Principle 15 Rio Declaration, which is widely referred to for its definition.[50] It holds that "where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measure to prevent environmental degradations."[51] As such, the precautionary principle is complementary to the no harm-principle applicable to scientifically proven risks only.[52]

Principle 15 Rio Declaration stresses that the principle only relates to scenarios where the – potential – damage is found to be serious or irreversible, thus constituting a high threshold for its application. Besides this, the limits and legal implications, if any, of the precautionary principle are debated.[53] It is seen by some as a rule to shift the burden of proof. According to this opinion, which was mainly brought forwards in dissenting and separate opinions but not yet followed by international courts,[54] the State "interested in undertaking or continuing a particular activity has to prove that such activities will not result in any harm, rather than the other side having to prove that it will result in harm."[55] In our understanding, this opinion does not argue, however, that the precautionary principle is confined to a shift of the burden of proof. Given the disputed normative status of the principle it is rather to be read as an attempt to formulate an already accepted aspect of the principle. The core of the principle is better

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49 The precautionary principle had its roots in Swedish and German environmental law before being adopted at the international level, see *Proelß*, Prinzipien des internationalen Umweltrechts, in: Proelß (ed.), Internationales Umweltrecht (2017), 84 with further sources.

50 *UN Conference on Environment and Development*, Rio Declaration on Environment and Development, UN Doc A/CONF.151/26, Vol. I (1992) [Rio Declaration].

51 Emphasis added.

52 *Proelß*, in: Proelß (ed.) (2017) (note 49), 80; see ICJ, *Gabčíkovo-Nagymaros Project (Hungary v Slovakia)* (Judgment) ICJ Rep 1997, para. 53 and Principle 2 Rio Declaration; according to a different view, the precautionary principle and the no-harm rule are not complementary but build upon each other, cf. *Trouwborst*, Prevention, Precaution, Logic and Law, Erasmus L Rev 2 (2009), 105.

53 Indeed, the customary nature of the precautionary principle is disputed, especially by the US, see on this issue *Proelß*, in: Proelß (ed.) (2017) (note 52), 87-88; ITLOS, *Southern Bluefin Tuna Cases (New Zealand v Japan; Australia v Japan)* (Provisional Measures) (Order of 1999) Cases Nos. 3 and 4, ITLOS Rep 1999, 280, para. 80 and *Responsibilities and Obligations of States Sponsoring Persons and Entities With Respect to Activities in the Area* (Advisory Opinion of 2001) Case No. 17, ITLOS Rep 2011, 10, paras 131–132, 135.

54 See *Benzing*, Das Beweisrecht vor internationalen Gerichten und Schiedsgerichten in zwischenstaatlichen Streitigkeiten (2010), 719 *et seq*.

55 ITLOS, *Mox Plant Case (Provisional Measures)*, sep. op. *Wolfrum*, ITLOS Rep. 2001, 131 (134).

expressed by another interpretation which echoes Principle 15 Rio Declaration. According to this interpretation, the precautionary principle is seen as a justification to adopt preventive measures in situations of scientific uncertainty or even as an impediment to justifying inaction due to scientific uncertainty[56]. According to the latter interpretation, the principle does not constitute an obligation to reach a certain result but rather constitutes an obligation of due diligence.[57]

It seems possible to argue that the rationale of the precautionary principle can inform the interpretation of the obligation to protect arising from the human right to health in cases of scientific uncertainty. Its origin in environmental law, however, raises the question on its applicability in the human rights context.

II. Relevance of the Precautionary Approach in the Human Rights Context

Linking the precautionary principle to human rights seems counterintuitive at first. Nevertheless, there are initial indications that such a link can be established. Both General Comment No. 25 [GC No. 25][58] and the jurisprudence of two regional human rights courts give rise to the thesis that the idea underlying the precautionary principle – we shall call this idea the precautionary *approach* in the following[59] – is also inherent to human rights and thus becomes relevant for their interpretation.

1. General Comment No. 25

A first indication of the relevance of the precautionary approach in the human rights context is given by GC No. 25, published in 2020, concerning the right to research and the right to participate in research results. The fact that GC No. 25 assumes a direct nexus between the human right to science under Article 15 ICESCR and the precautionary principle[60] is striking given the Comment's importance for the interpretation of the ICESCR. All General Comments to the ICESCR are adopted by the Committee on Economic, Social and Cultural Rights [CESCR], which is vested with the task to monitor the implementation of the ICESCR. As the notion "Comment" implies, the General Comments are not directly legally binding either on States or on courts.[61] As in other areas of "soft law", the General Comments can however be found to be *de facto* binding, having normative force and being in this sense

56 Cf. *Schröder*, 'Precautionary Approach/Principle', MPEPIL Online Edition 2014, para. 9.

57 *Malaihollo*, Due Dilligence in International Environmental Law and International Human Rights Law, Netherlands International Law Review 68 (2021), 121 (124).

58 *UN CESCR*, General Comment No. 25 (2020) on Science and Economic, Social and Cultural Rights (Article 15 (1) (b), (2), (3) and (4) of the International Covenant on Economic, Social and Cultural Rights), E/C.12/GC/25 (03.04.2020), available at https://docstore.ohchr.org/SelfServices/FilesHandler.ashx?enc=4slQ6QSmlBEDzFEovLCuW1a0Szab0oXTdImnsJZZVQdxONLLLJiul8wRmVtR5Kxx73i0Uz0k13FeZiqChAWHKFuBqp%2B4RaxfUzqSAfyZYAR%2Fq7sqC7AHRa48PPRRALHB.

59 By using the term precautionary approach, we do not, however, want to make a statement on the legal status of the precautionary principle under international law. Some refer to this principle as an approach to express that they dispute its qualification as customary international law, see *Peel*, Precautionary – A Matter of Principle. Approach or Process?, Melbourne Journal of International Law 5 (2004), 483.

60 *UN CESCR*, General Comment No. 25 (2020) (note 58), paras 56, 71.

61 *Azaria*, The Legal Significance of Expert Treaty Bodies Pronouncements for the Purpose of the Interpretation of Treaties, International Community Law Review 22 (2020), 33 (35). This is true at least from the classical theory of sources of public international law.

authoritative.[62] Apart from criticism that alleges an engagement of the Committee in "human rights activism",[63] the General Comments are mostly seen as a reflection of the current practice and interpretations of the ICESCR's provisions. As such, they must be considered, for example in the reports and surveys of State Parties.

According to GC No. 25, the right to participate in research results "includes the right to information and participation in controlling the risks involved in particular scientific processes and its applications. In this context, the precautionary principle plays an important role."[64] The Comment also states that "some scientific research can carry health-related *risks* […] [and] States Parties should prevent or mitigate these *risks* through careful application of the precautionary principle".[65] GC No. 25 assumes that regulatory obligations to protect the health of individuals can arise from balancing the right to participate in and to enjoy the benefits of scientific progress with the right to health, while applying the precautionary principle.

An objection to citing GC No. 25 could be based on the argument that the Comment remains vague about the connection between the right to science and the participation in scientific results, on the one side, and the precautionary principle, on the other side. Since it explicitly acknowledges that the applicability of the principle is sometimes disputed,[66] it can nevertheless be assumed that the Comment refers to the precautionary principle as accepted in international environmental law. Admittedly, it is unclear how the applicability of the principle originating in environmental law to the ICESCR is inferred. One could assume that the Comment is inspired by the desire to achieve a certain result, rather than engaging in an actual interpretation of the ICESCR's provisions. This impression particularly arises from the language applied in a passage of the GC No. 25 which holds that the precautionary principle should not be too restrictive on research, while at the same time, it should be able to provide effective protection for human health and the environment.[67]

Nevertheless GC No. 25 forms an initial basis to justify the assumption that the precautionary principle – or at least: a precautionary approach – becomes relevant in the human rights context.

2. The Jurisprudence of the European Court of Human Rights

Another indication for the relevance of the precautionary principle in the context of human rights can be drawn from the jurisprudence of the European Court of Human Rights [ECtHR]. The first decision on this aspect was rendered in 2009 in the case *Tătar v. Romania*.[68] The applicants lived close to a gold mine in Romania, which was exploited by a private company. Following an accident, approximately 100.000 m^3 of cyanide-contaminated water was released into the environment. A risk assessment undertaken by the Romanian Ministry of the Environment in 1993 had not been made available to the public. Furthermore, the company continued its operations after the accident without taking further measures.

62 *Saul/Kinley/Mowbary*, The International Covenant on Economic, Social and Cultural Rights: Commentary, Cases and Materials (2014), Introduction, 4.
63 For a critical assessment cf. *Bódig*, Soft Law, Doctrinal Development, and the General Comments of the UN Committee on Economic, Social and Cultural Rights, in: Lagoutte/Gammeltoft-Hansen/Cerone, Tracing the Roles of Soft Law in Human Rights (2016), 69 *et seq.*
64 *UN CESCR*, General Comment No. 25 (2020) (note 58), para. 56, emphasis added.
65 *UN CESCR*, General Comment No. 25 (2020) (note 58), para. 71, emphasis added.
66 *UN CESCR*, General Comment No. 25 (2020) (note 58), para. 57.
67 *UN CESCR*, General Comment No. 25 (2020) (note 58), para. 57.
68 ECtHR, *Tătar v. Romania* (Judgment) (2009), Application No. 67021/01.

The application was lodged under the right to life established by Article 2 ECHR[69], but was examined by the Court under Article 8 ECHR, the right to respect for private and family life. The Court held that Romania had failed to take appropriate measures to protect the rights of those concerned by the accident. It considered, *inter alia*, that the continuation of the company's operations after the accident without further effective and proportionate measures by Romania constituted a breach of Article 8 ECHR in view of the application of the precautionary principle.[70] The Court concluded on the status of the precautionary principle that it has evolved from a philosophical to a normative concept at the European level, following its inclusion in the European Treaty of Maastricht.[71]

Here again, therefore, a link is established between human rights provisions and the precautionary principle. What is regrettable, however, is that the Court remains largely silent on the boundaries of the principle as well as its concrete nexus with human rights.

3. The Jurisprudence of the Inter-American Court of Human Rights

A more recent decision was rendered by the Inter-American Court of Human Rights [IntACtHR] in 2017. In its Advisory Opinion OC-23/17,[72] the Court answered a request made by Colombia on the content, *inter alia*, of certain State obligations when there is a danger that the construction and operation of major new infrastructure projects may have severe effects on the environment. The Court examined Articles 4 and 5 of the American Convention on Human Rights [ACHR],[73] which establish, respectively, the right to life and the right to humane treatment. The relevant passage of the Court's Advisory Opinion is worth quoting. The Court held that

> "[180] […] the general obligation to ensure the rights to life and to personal integrity means that States must act diligently to prevent harm to these rights […]. Also, when interpreting the Convention, as requested in this case, the Court must always seek the "best perspective" for the protection of the individual […]. Therefore, the Court understands that States must *act in keeping with the precautionary principle in order to protect the rights to life and to personal integrity in cases where there are plausible indications that an activity could result in severe and irreversible damage to the environment*, even in the absence of scientific certainty. Consequently, States must act with due caution to prevent possible damage. Thus, in the context of the protection of the rights to life and to personal integrity, the Court considers that States must act in keeping with the precautionary principle. Therefore, even in the absence of scientific certainty, they must take "effective" measures to prevent severe or irreversible damage."[74]

The Advisory Opinion of the IntACtHR was critically assessed. The application of the precautionary principle in the interpretation of the rights established under Articles 4 and 5 ACHR was held to be

69 Convention for the Protection of Human Rights and Fundamental Freedoms (adopted 04.11.1950, entered into force 03.09.1953), 213 UNTS 221 [ECHR].
70 ECtHR, *Tătar v. Romania* (note 68), paras 120–125.
71 ECtHR, *Tătar v. Romania* (note 68), 27.
72 IntACtHR, Advisory Opinion OC-23/17 requested by the Republic of Colombia (15.11.2017), available at https://www.corteidh.or.cr/docs/opiniones/seriea_23_ing.pdf.
73 American Convention on Human Rights (adopted 22.11.1969, entered into force 18.07.1978), 1144 UNTS 123 [ACHR].
74 IntACtHR, Advisory Opinion OC-23/17 (note 72), para. 180, emphasis added.

"adventurous" by some.[75] This criticism now warrants a closer look at the question how the application of a principle originating from international environmental law can be justified under human rights law. We shall examine to what extent the Court actually applies the precautionary principle to the human rights obligations in a strict sense of the term.

First, the Court could indeed have directly applied the precautionary principle as developed in international environmental law to human rights law. This follows from the fact that the Court was asked how State obligations should be interpreted, also taking into account rules of customary law.[76] Against the background of this question, it is possible that the Court refers to the precautionary principle as a rule accepted in international environmental law, even if its validity under customary law is not entirely certain.[77] How such an application to another area of law could be justified remains an open issue, as it did in GC No. 25 and the ECtHR's judgment as well.

Second, and by contrast, the Court itself notes that meaning and effect of the precautionary principle vary according to the given context.[78] Furthermore, it explicitly states that it must interpret the relevant human rights provision from the "best perspective" for the protection of the individuals' rights.[79] It is the consequence of the interpretation from that "*mejor ángulo*" that the Court arrives at the conclusion that effective measures have to be taken, even in the absence of scientific certainty.[80] This is not the same as the application of the precautionary principle to human rights provisions in a strict sense. It rather points to an understanding that the idea underlying the precautionary principle, in fact a precautionary approach, is already logically inherent to (at least some) human rights. This seems plausible since the codification of human rights serves to strive for their best possible realisation.

4. Application of a Precautionary Approach in the Interpretation of the Right to Health

In view of this understanding of the IntACtHR's advisory opinion, we argue that any interpretation of the obligation to protect under human rights must consider a precautionary approach in situations in which potential damage would be irreversible. Such an interpretation is justified by taking into account the object and purpose of human rights treaties in accordance with Article 31 (1) of the Vienna Convention on the Law of Treaties [VCLT][81], the *telos* of the human rights treaties being to strive for the best possible realisation of the rights contained therein.[82] In situations in which potential damage would be irreversible, the best possible realisation of a human right necessarily requires protection in advance as subsequent adjustments are devoid of purpose.[83] If the probability of irreversible damage cannot be clearly determined due to scientific uncertainty, this should not run to the detriment of the potentially

75 *Kahl*, Ökologische Revolution am Interamerikanischen Gerichtshof für Menschenrechte, EurUP 2 (2019), 110 (125); see also *Voeneky/Beck*, Umweltschutz und Menschenrechte, in: Proelß (ed.), Internationales Umweltrecht (2nd ed. forthcoming in 2022), para. 65e; less critical *Markus/Silva-Sánchez*, Zum Schutz der Umwelt durch die Amerikanische Menschenrechtskonvention: Das Gutachten des IAGMR OC-23/2017, ZUR (2019), 150 (156).

76 IntACtHR, Advisory Opinion OC-23/17 (note 72), para. 1.

77 See note 53.

78 IntACtHR, Advisory Opinion OC-23/17 (note 72), para. 179.

79 IntACtHR, Advisory Opinion OC-23/17 (note 72), paras 41, 180.

80 IntACtHR, Advisory Opinion OC-23/17 (note 72), para. 180; see *Kahl*, EurUP 2 (2019) (note 75), 125.

81 Vienna Convention on the Law of Treaties (adopted on 12.05.1968, entered into force on 27.01.1980), 1155 UNTS 331 [VCLT].

82 *Voeneky*, Der Einfluss völkerrechtlicher Rahmenbedingungen auf die Entwicklung sozialer Strukturen, in: Stürner/Bruns, Globalisierung und Sozialstaatsprinzip (2014), 63 (76).

83 *Ekardt*, Menschenrechte und Klimaschutz, RphZ (2020), 20 (37).

affected rights where preventive measures could be taken and impeding damage is serious. This, in turn, is the essence of the precautionary principle as it stands in international (environmental) law. As for the prevention of pandemics, this means that States must proactively protect the right to health where it would become practically ineffective if States only responded to already materialised irreversible harm. This approach is not incompatible with the fact that human-rights are considered by some to be a self-contained regime.[84] Under such a regime, principles of another area of law cannot be transferred.[85] Regardless of how far this objection may actually reach,[86] it cannot be upheld in our case: As we try to show that the precautionary approach is already logically inherent to (some) human rights, we interpret regime itself and do not transfer a principle from another areas of law to it.

Indeed, this proposed interpretation of the human rights is supported by the IntACtHR's interpretation of the right to health from the "best perspective" for the protection of the individuals' rights[87] as well as by the interpretation of the ECHR by the ECtHR. This Court underlines that the ECHR must guarantee rights that are "practical and effective".[88] Finally, this idea that a precautionary approach is inherent to certain human rights obligations can be derived from GC No. 25 as well as it was concerned with risk scenarios in which (potential) damage is irreversible.

One possible objection to this interpretation of human rights is that it may lead to excessive regulatory obligations. This, however, is not convincing for two reasons. *First*, any regulation of private activities based on e.g. Article 12 ICESCR must take into account the limits of Articles 4 and 5 ICESCR. Regulation of private activities bearing risks does therefore not necessarily lead to the prohibition of a certain conduct. As a first step, States must identify and subsequently assess in a continuous manner the activities that bear a risk of a pandemic through a risk assessment[89] which must also be published. Whether a certain conduct must then be subjected to a regulatory regime or prohibited by the State ultimately depends on an assessment of the conflicting interests. In this sense, we partly disagree with the ECtHR's assessment in the above-cited *Tătar* judgment: the Court limits the application of the precautionary principle in the sense that a possible duty to prohibit a conduct can only be considered if there has already been an accident and it is merely uncertain whether another one will occur.[90]

Such a two-step approach also helps to address the question which conduct must be regulated at all, since everyday conduct or, as called elsewhere, "micro-events"[91] can also bear the risk of contact between a human and a pathogen resulting in infection and creating the risk of a pandemic. It has been pointed out that such situations are too numerous to be addressed in their entirety.[92] In those situations,

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84 See *Klein*, Self-Contained Regime, MPEPIL Online Edition 2006, para. 14.

85 Cf. *Case of the S.S. "Wimbledon"* (*UK, France, Italy, Japan v.* Germany) PCIJ Rep Series A No 1, 15 (22-23); *ILC,* Articles on Responsibility of States for Internationally Wrongful Acts (note 6), Art. 55, commentary para. 5.

86 *Simma*, e.g., points to the fact, that self-contained regimes are not to. be misunderstood to by „entirely autonomous legal subsystems". With reference to Luhmann's *Systemtheorie*, he emphasises that all systems are interlinked, *ibid.* EJIL 17 (2006), 483 (492).

87 IntACtHR, Advisory Opinion OC-23/17 (note 72), paras 41, 180.

88 ECtHR, *Airey v. Ireland* (Judgment) (1979), Application No. 6289/73, para. 27.

89 See also *Pedro A. Villareal*, Pandemic Risk and International Law: Foundations for Proactive Obligations in: Cubie/Hesselman/Telesetsky (eds), Yearbook of International Disaster Law Vol. 3 (2020, forthcoming), 16.

90 ECtHR, *Tătar v. Romania* (note 68), para. 120.

91 *Villareal* (2020) (note 8991), 9.

92 *Villareal* (2020) (note 89), 9.

a precautionary approach allows to distinguish, through an assessment of the conflicting interests, acceptable risks from such risks that must be regulated. In this way, a precautionary approach not only widens the scope of possible State obligations but simultaneously sets limits to them. And indeed, *second*, the threshold for the application of a precautionary approach is very high. This approach only applies if basic goods as enshrined in the international order, such as life and health, are at risk and the potential damage is particularly great and irreversible.

Another possible objection is that State obligations under this interpretation of the right to health are impractical and because of this ultimately ineffective. Health risk assessments, used for identifying and assessing the effects of certain policies on the human health, are already conducted in certain countries.[93] They are, however, not yet as widespread as environmental impact assessments,[94] for which more specific frameworks have been developed under international customary and treaty law.[95] Health risk assessments also face the problem that private activities are very diverse and causal chains attached to them are complex.[96] This is, to a certain extent, a problem shared with environmental impact assessments at least in earlier years: with the advancement of scientific methods and knowledge, however, environmental impact assessments have come to be more conclusive on both the existence of certain risks as well as causalities. Therefore, the practical difficulties surrounding health impact assessments will most likely also be solved with time. The States' obligation to conduct such assessments should be based on the use of the latest scientific standards and may imply an obligation to initiate further research; it is not an obligation to do the scientifically impossible. And even when a certain conduct reaches a threshold where States must regulate or prohibit it, this obligation is not one of result. The international responsibility of a State does not depend on the question whether a pandemic arose in the end. Preventive obligations under the right to health, similarly as those under international environmental law,[97] are due diligence obligations.[98]

F. Results and Outlook

Specific regulations for the prevention of pandemics, such as those contained primarily in the IHR, address the case in which a risk to the health of individuals has already materialised and is to be mitigated. The right to health under Article 12 ICESCR and Article 6 ICCPR, by contrast, also applies at an earlier stage. It entails an obligation to protect, which becomes relevant when private conduct is the reasonably foreseeable or even certain cause for a pandemic. It is, however, not confined to that. The obligation to protect according to the right to health entails the obligation for States to regulate private conduct that creates the risk of transmission of a pathogen to humans, thereby potentially leading to the emergence of a pandemic. A State cannot justify its inaction in this regard with the lack of scientific certainty regarding the probability of the occurrence and the extent of health damages since a precautionary approach is inherent to the human right to health. This follows from an interpretation of the right to health which must be brought to its best possible effect.

93 *Villareal* (2020) (note 89), 8 with further references.
94 *Villareal* (2020) (note 89), 9.
95 See, for details, *Epiney*, Umweltschutz durch Verfahren, in: Proelß (ed.), Internationales Umweltrecht (2017), 115ff.
96 *Villareal* (2020) (note 89), 8 with further references.
97 See *Schmalenbach*, Verantwortlichkeit und Haftung, in: Proelß (ed.), Internationales Umweltrecht (2017), 218f.
98 For the same conclusion see *Villareal* (2020) (note 89), 15 and 18.

The Covid-19 pandemic has brought two scenarios to public awareness that bear the risk of leading to a global pandemic and that allow us to illustrate the effects of the proposed interpretation of the right to health. Both scenarios, which may potentially occur (again) in the future, are indeed only appropriately addressed by an application of the right to health interpreted in light of a precautionary approach. *First*, the virus may have originated in a wild animal market – then the current pandemic would be the materialisation of a risk inherent to the ever-closer contact between humans and other animals as foretold by scientists.[99] Addressing such risks and preventing future pandemics means to reconsider and regulate our treatment of other animals and their natural habitats. *Second*, the virus may have originated in a laboratory – the pandemic would then remind us that the advancement of scientific research comes with a great and still growing responsibility.[100] States must engage in meaningful discussions on a national (and international) level on the appropriate standards for the assessment and handling of health risks related to research on pathogens.[101] This must lead to rules on how to make scientific research as safe as possible, taking due account of the boundaries set by Articles 4 and 5 ICESCR and their equivalent in the ICCPR. The right to health with its inherent precautionary approach contains substantial obligations for States to act on this behalf with a view to preventing future pandemics. The Covid-19 pandemic should be a decisive incentive for States to take action to protect the right to health of individuals and, most importantly, to do so before another global crisis arises.

99 See *Gibb* et al., Zoonotic Host Diversity Increases in Human-Dominated Ecosystems, Nature (2020), 398.

100 For example, it has been revealed that the US National Institute of Health has funded gain of function research at the Wuhan Institute of Virology, which is the alleged origin of the Covid-19 pandemic (see note 5). See *Eban*, In Major Shift, NIH Admits Funding Risky Virus Research in Wuhan, in: Vanity Fair (22.10.2021), available at https://www.vanityfair.com/news/2021/10/nih-admits-funding-risky-virus-research-in-wuhan?utm_source=onsite-share&utm_medium=email&utm_campaign=onsite-share&utm_brand=vanity-fair; *Wain-Hobson*, Außer Kontrolle, in: FAZ (23.10.2021), available at https://www.faz.net/aktuell/wissen/medizin-ernaehrung/corona-gefaehrliche-virus-experimente-am-wuhan-institut-17590511.html. On the risks related to gain of function research generally, see the Press Release by *US Congressman Henry Cuellar* on the Introduction of Bipartisan Legislation to Prevent Future Man-Made Pathogens from Entering US Communities (10.09.2021), available at https://cuellar.house.gov/news/documentsingle.aspx?DocumentID=406488; *Esvelt*, Opinion: Manipulating viruses and risking pandemics is too dangerous. It's time to stop. in: The Washington Post (07.10.2021), available at https://www.washingtonpost.com/opinions/2021/10/07/manipulating-viruses-risking-pandemics-is-too-dangerous-its-time-stop/.

101 See, for example, Principles 1, 4 and 7 of the Model Code for Conduct for Biological Scientists calling for legal regulations and standards on scientific research as well as risk control, effective prevention and emergency response and strengthened oversight of scientific institutions: *Meeting of the States Parties to the Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on Their Destruction,* Proposal for the Development of a Model Code of Conduct for Biological Scientists under the Biological Weapons Convention (Submitted by China and Pakistan) (09.08.2018), BWC/MSP/2018/MX.2/WP.9, available at https://undocs.org/en/BWC/MSP/2018/MX.2/WP.9.

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