WEBVTT

1 00:00:01.720 --> 00:00:05.830 <v ->Hello everyone, and welcome to the</v>

2 00:00:06.670 --> 00:00:09.150 inaugural seminar of the

3 00:00:11.830 --> 00:00:13.800 Yale Global Initiative on Climate Change

4 00:00:13.800 --> 00:00:15.250 and Public Health Ethics,

5 00:00:15.250 --> 00:00:19.000 as a part of the Yale Center for Climate Change

6 00:00:19.000 --> 00:00:19.833 and Health.

7 00:00:20.690 --> 00:00:22.000 My name is Laura Bothwell,

8 00:00:22.000 --> 00:00:25.650 and I'm delighted to welcome you to this seminar,

9 00:00:25.650 --> 00:00:28.850 which is also the first in a series of three virtual,

10 00:00:28.850 --> 00:00:32.010 or hybrid noontime seminars

11 00:00:32.010 --> 00:00:35.150 this term on various topics related to climate change

12 00:00:35.150 --> 00:00:37.030 and public health ethics.

13 00:00:37.030 --> 00:00:39.350 As you've seen this seminar is being recorded

14 00:00:39.350 --> 00:00:42.590 and we'll have about 15 minutes starting at 12:45

15 00:00:42.590 --> 00:00:45.060 for questions and answers.

16 00:00:45.060 --> 00:00:47.730 It is such a privilege to introduce Stephen Latham,

17 00:00:47.730 --> 00:00:51.320 director of the Yale Interdisciplinary Center for Bioethics.

18 00:00:51.320 --> 00:00:54.400 Dr. Latham has a JD and a PhD.

19 00:00:54.400 --> 00:00:57.920 He's a fellow of the Hasting Center and teaches bioethics

20 00:00:57.920 --> 00:01:00.940 and environmental ethics in the Yale College,

21 00:01:00.940 --> 00:01:04.090 the Yale Law School and the School of the Environment.

22 00:01:04.090 --> 00:01:07.270 He chairs the Human Subjects Committee at Yale.

23 00:01:07.270 --> 00:01:09.570 Co-chairs the Embryonic Stem Cell Research

24 00:01:09.570 --> 00:01:10.940 Oversight Committee

25 00:01:10.940 --> 00:01:12.810 and does clinical ethics consultation

26 00:01:12.810 --> 00:01:14.780 at the Yale New Haven Hospital.

27 00:01:14.780 --> 00:01:17.210 He is a former board member and secretary

28 00:01:17.210 --> 00:01:20.400 of the American Society for Bioethics and Humanities

29 00:01:20.400 --> 00:01:23.130 from which he received a distinguished service award

30 00:01:23.130 --> 00:01:24.320 in 2010.

31 00:01:24.320 --> 00:01:26.460 And today we are so lucky to hear from him

32 00:01:26.460 --> 00:01:30.380 speaking about geoengineering for climate crisis mitigation,

33 00:01:30.380 --> 00:01:33.853 accountability, transparency, and democracy.

34 00:01:36.700 --> 00:01:37.963 <v ->Well, hello everyone.</v>

35 00:01:39.901 --> 00:01:40.740 I'm starting my timer,

36 00:01:40.740 --> 00:01:43.060 so I will be sure to have some time at the end

37 00:01:43.060 --> 00:01:44.053 for some questions.

38 00:01:46.000 --> 00:01:49.450 It's a more grand title than I would like actually

39 00:01:49.450 --> 00:01:51.020 and I'm not sure how much

40 00:01:51.020 --> 00:01:53.070 I'm gonna get to talk about democracy,

41 00:01:53.070 --> 00:01:56.633 but I certainly will be talking about accountability.

42 00:01:58.670 --> 00:02:02.040 So the topic is geoengineering

43 00:02:02.040 --> 00:02:06.690 and there has been in the environmental community

44 00:02:08.890 --> 00:02:13.350 a long tradition of opposition to the very idea of engaging

45 00:02:13.350 --> 00:02:17.020 in geoengineering as a response to climate change

46 00:02:17.020 --> 00:02:19.940 for reasons that I'll be addressing later.

47 00:02:19.940 --> 00:02:23.380 But I think there is increasingly

48 00:02:24.520 --> 00:02:29.200 an awareness that our international efforts

49 00:02:29.200 --> 00:02:33.220 to address climate change are pretty feeble

50 00:02:33.220 --> 00:02:36.750 and that we are very likely to overshoot

51 00:02:38.249 --> 00:02:41.030 the one and a half degree temperature

52 00:02:42.130 --> 00:02:45.003 goal that was set in Paris.

53 00:02:46.900 --> 00:02:51.830 And many voices are saying that no matter how quickly

54 00:02:51.830 --> 00:02:56.387 we manage to adjust the way we produce energy and the way

55 00:02:57.250 --> 00:03:01.320 we emit greenhouse gases,

56 00:03:01.320 --> 00:03:04.950 it won't be enough to avoid really catastrophic side effects

57 00:03:04.950 --> 00:03:06.340 of climate change

58 00:03:06.340 --> 00:03:10.460 and that we will need to do some form of geoengineering

59 00:03:10.460 --> 00:03:14.913 to get ourselves into a tolerable situation.

60 00:03:16.890 --> 00:03:20.170 So let me now talk about a couple of kinds of things

61 00:03:20.170 --> 00:03:23.660 that fall under the name of geoengineering.

62 00:03:23.660 --> 00:03:26.450 There are two major sort of subgroups.

63 00:03:26.450 --> 00:03:29.240 One is just carbon dioxide removal,

64 00:03:29.240 --> 00:03:31.110 which comes in many, many forms,

65 00:03:31.110 --> 00:03:32.800 which I'll discuss in a second.

66 00:03:32.800 --> 00:03:36.660 And the other is solar radiation management,

67 00:03:36.660 --> 00:03:39.260 which in one form or another involves

68 00:03:39.260 --> 00:03:41.430 in increasing the albedo of the earth,

69 00:03:41.430 --> 00:03:44.740 the reflectivity of the earth to bounce back

70 00:03:44.740 --> 00:03:46.910 some of the sun's energy and heat

71 00:03:47.920 --> 00:03:51.883 in order to lower the temperature of the world.

72 00:03:53.660 --> 00:03:55.540 I'll say first something about

73 00:03:55.540 --> 00:03:58.520 carbon dioxide removal methods.

74 00:03:58.520 --> 00:04:01.000 The one that we've all heard about is, of course,

75 00:04:01.000 --> 00:04:04.030 planting, reforestation and afforestation,

76 00:04:04.030 --> 00:04:07.920 the planting of different kinds of crops

77 00:04:07.920 --> 00:04:10.610 that will absorb carbon and so on,

78 00:04:10.610 --> 00:04:13.940 where there are other already well established methods

79 00:04:13.940 --> 00:04:15.800 of removing carbon from the air,

80 00:04:15.800 --> 00:04:18.340 things like biochar, or

81 00:04:19.868 --> 00:04:23.580 bioenergy energy use with carbon capture and storage, Becks,

82 00:04:23.580 --> 00:04:24.520 which involves

83 00:04:26.040 --> 00:04:27.470 burning biomass

84 00:04:28.320 --> 00:04:29.630 in a controlled way

85 00:04:29.630 --> 00:04:31.510 and capturing the carbon from that burning

86 00:04:31.510 --> 00:04:32.963 and then storing that.

87 00:04:34.410 --> 00:04:38.650 We have plans to increase the amount of carbon

88 00:04:38.650 --> 00:04:40.920 that can be sequestered in soils.

89 00:04:40.920 --> 00:04:45.920 We have this idea of sinking biomass so deep in the ocean

90 00:04:46.250 --> 00:04:49.990 that it will not be able to degrade there,

91 00:04:49.990 --> 00:04:52.540 things like growing lots and lots of kelp

92 00:04:52.540 --> 00:04:55.850 and then hauling it out to sea and waiting it down,

93 00:04:55.850 --> 00:04:57.670 so it sinks to the bottom of the sea

94 00:04:57.670 --> 00:05:00.900 and in theory will not release its carbon

95 00:05:00.900 --> 00:05:02.403 for many centuries.

96 00:05:04.110 --> 00:05:06.050 We have the idea of enhanced weathering,

97 00:05:06.050 --> 00:05:09.430 particularly at the seashore that will,

98 00:05:09.430 --> 00:05:12.130 where the action of the sea on certain kinds of rocks

99 00:05:12.130 --> 00:05:13.423 will capture carbon.

100 00:05:14.320 --> 00:05:17.200 The idea of fertilizing the ocean with bits of iron

101 00:05:17.200 --> 00:05:20.223 to increase algal growth,

102 00:05:21.120 --> 00:05:24.623 which will capture carbon as well and then sink.

103 00:05:27.404 --> 00:05:32.100 Oh, and the idea of restoration of our coastal wetlands,

104 00:05:32.100 --> 00:05:34.370 which are actually really excellent carbon sinks

105 00:05:34.370 --> 00:05:36.110 of themselves.

106 00:05:36.110 --> 00:05:40.970 There's quite a wide range of carbon capture techniques

107 00:05:40.970 --> 00:05:41.860 and then of course,

108 00:05:41.860 --> 00:05:46.730 we have this new-ish idea of direct air carbon capture

109 00:05:46.730 --> 00:05:48.480 in factories that

110 00:05:50.290 --> 00:05:52.420 withdraw carbon from the air

111 00:05:52.420 --> 00:05:54.273 using chemistry of different kinds,

112 00:05:54.273 --> 00:05:57.023 there's several different kinds out there now.

113 00:05:58.236 --> 00:06:02.910 And then sequester that carbon possibly underground,

114 00:06:02.910 --> 00:06:05.583 possibly with other methods.

115 00:06:08.480 --> 00:06:12.713 These things are not terribly controversial,

116 00:06:14.000 --> 00:06:15.220 most of them,

117 00:06:15.220 --> 00:06:17.440 I think there are some issue with the idea

118 00:06:17.440 --> 00:06:19.470 of dropping biomass into the sea

119 00:06:19.470 --> 00:06:23.160 because there are questions about where it might wash up

120 00:06:23.160 --> 00:06:25.550 and how effective it might be.

121 00:06:25.550 --> 00:06:28.610 There are several problems with these things,

122 00:06:28.610 --> 00:06:31.880 most of them are not terribly scalable,

123 00:06:31.880 --> 00:06:36.610 most of them are pretty expensive for the amount of carbon

124 00:06:36.610 --> 00:06:40.200 that they'll actually succeed in sequestering,

125 00:06:40.200 --> 00:06:43.560 but many of them would be susceptible

126 00:06:43.560 --> 00:06:45.960 to pretty much local governance,

127 00:06:45.960 --> 00:06:48.070 much of their environmental impact

128 00:06:48.070 --> 00:06:50.603 for most of these methods would be local.

129 00:06:51.960 --> 00:06:55.300 The business of fertilizing the sea

130 00:06:55.300 --> 00:06:58.190 raises some issues about accountability

131 00:06:58.190 --> 00:06:59.980 and international accountability.

132 00:06:59.980 --> 00:07:02.470 But I think the biggest,

133 00:07:02.470 --> 00:07:05.620 one of the biggest problems in this area is with monitoring

134 00:07:05.620 --> 00:07:08.750 and reporting and verification because

135 00:07:08.750 --> 00:07:13.750 there are a lot of controversies about the way in which,

136 00:07:14.270 --> 00:07:17.090 for example, carbon sequestration in plants

137 00:07:17.090 --> 00:07:21.450 is being counted, whether reforestation, for example,

138 00:07:21.450 --> 00:07:25.620 is really new reforestation that will capture carbon

139 00:07:25.620 --> 00:07:28.290 that wasn't going to be captured by forests

140 00:07:28.290 --> 00:07:30.053 that were gonna be planted anyway.

141 00:07:31.270 --> 00:07:35.580 And there are questions about competing values for land use

142 00:07:35.580 --> 00:07:38.473 associated with some of these methods,

143 00:07:40.520 --> 00:07:44.680 but these are as a group far less controversial

144 00:07:44.680 --> 00:07:47.610 than the solar radiation management varieties

145 00:07:47.610 --> 00:07:52.310 of geoengineering because mostly what they're doing

146 00:07:52.310 --> 00:07:55.570 is simply trying to remove carbon from the air

147 00:07:56.760 --> 00:07:59.370 and the likelihood

148 00:08:03.101 --> 00:08:08.101 of having any kind of unexpected disproportionate impact

149 00:08:08.500 --> 00:08:11.890 anywhere in the world from these methods is pretty low.

150 00:08:11.890 --> 00:08:13.710 Again, the ones that involve the ocean

151 00:08:13.710 --> 00:08:16.010 are probably the most controversial of them,

152 00:08:16.010 --> 00:08:17.260 but most of these

153 00:08:20.870 --> 00:08:25.870 do not pose many difficult governance kinds of issues.

154 00:08:27.230 --> 00:08:31.033 We need better monitoring, reporting and verification.

155 00:08:32.360 --> 00:08:33.193 And

156 00:08:34.300 --> 00:08:37.920 we need probably some rules about how

157 00:08:37.920 --> 00:08:40.550 and where carbon is going to be sequestered,

158 00:08:40.550 --> 00:08:42.870 especially if carbon is not sequestered

159 00:08:42.870 --> 00:08:46.003 in the same location where it's being drawn out of the air.

160 00:08:47.800 --> 00:08:51.820 And most of these methods also

161 00:08:51.820 --> 00:08:54.310 should involve some kind of involvement

162 00:08:54.310 --> 00:08:56.550 of the public in the location

163 00:08:56.550 --> 00:09:01.400 where these carbon reduction methods are going to be used.

164 00:09:02.970 --> 00:09:05.320 So for example, if you're gonna do enhanced weathering

165 00:09:05.320 --> 00:09:07.680 on a shore line by depositing

166 00:09:09.620 --> 00:09:14.000 minerals there that will capture carbon with wave action,

167 00:09:14.000 --> 00:09:17.540 you'll wanna talk to the people who use that shoreline

168 00:09:17.540 --> 00:09:22.540 and you'll want to engage in some kind of public discussion

169 00:09:23.130 --> 00:09:27.220 and get the permission from the relevant public authorities.

170 00:09:27.220 --> 00:09:29.740 Same thing with carbon sequestration underground

171 00:09:29.740 --> 00:09:30.593 in the salt,

172 00:09:32.610 --> 00:09:34.780 there's a proposal now to sequester carbon

173 00:09:34.780 --> 00:09:38.453 in bottom of fracking mines,

174 00:09:40.000 --> 00:09:43.360 those kinds of things should involve local permission

175 00:09:43.360 --> 00:09:45.880 and local governance.

176 00:09:45.880 --> 00:09:48.300 There are a few kinds of codes

177 00:09:48.300 --> 00:09:50.000 of professional responsibility

178 00:09:50.000 --> 00:09:52.180 that have been put out there,

179 00:09:52.180 --> 00:09:54.940 completely non-binding, just put out by different groups,

180 00:09:54.940 --> 00:09:56.940 in one case by single author,

181 00:09:56.940 --> 00:10:01.510 there are the Oxford principles,

182 00:10:01.510 --> 00:10:04.130 there's the (mumbles) principles for research

183 00:10:04.130 --> 00:10:07.100 in climate engineering techniques.

184 00:10:07.100 --> 00:10:09.900 And there's a single author code of conduct

185 00:10:09.900 --> 00:10:12.580 for responsible geoengineering research

186 00:10:12.580 --> 00:10:16.100 and the last two of those are very explicit

187 00:10:16.100 --> 00:10:18.560 of calling for public participation.

188 00:10:18.560 --> 00:10:22.150 So to the extent that researchers in geoengineering

189 00:10:23.520 --> 00:10:28.250 voluntarily choose to follow some of these available codes

190 00:10:28.250 --> 00:10:30.663 of research conduct,

191 00:10:31.810 --> 00:10:34.090 we will see some public

192 00:10:35.200 --> 00:10:36.280 participation

193 00:10:37.812 --> 00:10:42.380 and some openness and accountability.

194 00:10:42.380 --> 00:10:46.950 All of these principles call for periodic reporting

195 00:10:46.950 --> 00:10:49.760 of results and transparency

196 00:10:49.760 --> 00:10:53.303 in terms of how well the techniques are working,

197 00:10:55.030 --> 00:10:56.290 but there is

198 00:10:57.190 --> 00:11:01.410 very little explicitly binding law

199 00:11:02.720 --> 00:11:05.493 that deals with any of these methods,

200 00:11:08.870 --> 00:11:10.483 in all likelihood,

201 00:11:13.834 --> 00:11:18.230 the Framework Convention on Climate Change

202 00:11:18.230 --> 00:11:20.580 will be able to come up with

203 00:11:21.670 --> 00:11:25.440 some monitoring mechanisms,

204 00:11:25.440 --> 00:11:27.880 they are explicitly mentioned in that framework.

205 00:11:27.880 --> 00:11:31.160 And there's also explicit mention of the need

206 00:11:31.160 --> 00:11:34.360 to govern sequestration locations.

207 00:11:34.360 --> 00:11:37.150 So there is some promise of some kind of governance

208 00:11:37.150 --> 00:11:39.170 in this area, but again, in general,

209 00:11:39.170 --> 00:11:41.900 the is not where the controversy lies.

210 00:11:41.900 --> 00:11:45.703 The controversy really lies with solar radiation management.

211 00:11:48.090 --> 00:11:49.930 There are a couple of major types

212 00:11:49.930 --> 00:11:51.640 of solar radiation management.

213 00:11:51.640 --> 00:11:53.690 I'll say a little bit about each of them.

214 00:11:54.780 --> 00:11:59.050 First, there is marine cloud brightening.

215 00:11:59.050 --> 00:12:03.170 This involves injecting salt possibly from ocean water

216 00:12:03.170 --> 00:12:06.960 into the clouds above the sea and brightening them up

217 00:12:06.960 --> 00:12:08.730 so that they have greater albedo

218 00:12:08.730 --> 00:12:10.623 and will be more reflective.

219 00:12:11.890 --> 00:12:16.130 This looks like it would be pretty inexpensive to do,

220 00:12:16.130 --> 00:12:18.963 it would involve a fleet of,

221 00:12:21.260 --> 00:12:23.840 to have an effect at the global level,

222 00:12:23.840 --> 00:12:26.860 we would have to have a fleet of many ships

223 00:12:26.860 --> 00:12:30.290 spraying salt into the sky above the oceans.

224 00:12:30.290 --> 00:12:32.710 That fleet would have to be mobile because

225 00:12:34.350 --> 00:12:37.570 the impact of the sun changes as the seasons change

226 00:12:37.570 --> 00:12:42.570 and so on, would wanna position the reflective clouds

227 00:12:43.040 --> 00:12:45.130 in places that would have optimal effect

228 00:12:45.130 --> 00:12:46.963 on global temperature.

229 00:12:48.700 --> 00:12:53.700 It seems to be possibly effective and possibly rather cheap.

230 00:12:54.460 --> 00:12:58.253 And especially if the material used is salt water,

231 00:12:59.380 --> 00:13:02.180 there don't seem to be that many

232 00:13:02.180 --> 00:13:05.063 immediate polluting side effects.

233 00:13:08.460 --> 00:13:12.500 Marine cloud brightening also has a great deal of promise

234 00:13:12.500 --> 00:13:15.850 as a method of local protection from the sun.

235 00:13:15.850 --> 00:13:19.420 So for example, Australia is paying for some research

236 00:13:19.420 --> 00:13:21.590 in this area because they believe

237 00:13:21.590 --> 00:13:23.900 that they could do marine cloud brightening

238 00:13:23.900 --> 00:13:28.900 over the barrier reef to prevent, to lower temperature

239 00:13:29.090 --> 00:13:30.940 and lower the amount of sun striking

240 00:13:30.940 --> 00:13:32.913 and prevent bleaching of the coral.

241 00:13:33.790 --> 00:13:38.000 There's also some possibility that at marine cloud bleaching

242 00:13:40.029 --> 00:13:42.750 could be used in the Arctic

243 00:13:42.750 --> 00:13:46.393 to prevent certain kinds of runoff and so on.

244 00:13:48.513 --> 00:13:53.513 So there's real possibility of marine cloud bleaching

245 00:13:54.110 --> 00:13:57.910 being used all around the world

246 00:13:57.910 --> 00:14:00.780 and having an effect on global temperature.

247 00:14:00.780 --> 00:14:03.550 I'm gonna talk a little bit about

248 00:14:05.560 --> 00:14:08.290 downstream effects of that in a moment,

249 00:14:08.290 --> 00:14:10.760 but let me first say a little bit about

250 00:14:10.760 --> 00:14:13.410 stratospheric aerosol injection.

251 00:14:13.410 --> 00:14:15.980 Stratospheric aerosol injection

252 00:14:15.980 --> 00:14:17.890 involves putting reflective particle

253 00:14:17.890 --> 00:14:20.873 of one kind of substance or another,

254 00:14:22.080 --> 00:14:25.703 often sulfur related substances,

255 00:14:27.830 --> 00:14:30.930 injecting those into the stratosphere, which is stable

256 00:14:30.930 --> 00:14:33.860 compared to the lower parts of the atmosphere.

257 00:14:33.860 --> 00:14:37.350 Those particles would remain there for roughly three years

258 00:14:37.350 --> 00:14:42.350 and would reflect the suns rays back into outer space.

259 00:14:46.590 --> 00:14:50.400 It looks like it would be very inexpensive to do,

260 00:14:50.400 --> 00:14:55.070 the total numbers are in 25 to 50 billion dollars

261 00:14:55.070 --> 00:14:55.903 to have

262 00:14:58.817 --> 00:15:00.140 planetary, wide, global temperature reduction

263 00:15:05.178 --> 00:15:09.200 of all of the temperature that has risen

264 00:15:09.200 --> 00:15:11.833 because of greenhouse gases.

265 00:15:13.160 --> 00:15:14.370 The theory is that

266 00:15:14.370 --> 00:15:16.740 you could begin to see global temperatures fall

267 00:15:16.740 --> 00:15:20.963 even within one year of doing this aerosol spraying.

268 00:15:25.884 --> 00:15:30.040 And that the temperatures could be brought down

269 00:15:31.370 --> 00:15:34.440 to sort of pre-climate change level

270 00:15:34.440 --> 00:15:36.540 in a matter of a couple of years,

271 00:15:36.540 --> 00:15:39.490 but then of course the spraying would have to be maintained

272 00:15:40.370 --> 00:15:43.423 to keep the temperature level steady.

273 00:15:44.260 --> 00:15:47.950 So it has the promise of being stunningly effective

274 00:15:47.950 --> 00:15:50.763 and relatively inexpensive,

275 00:15:53.130 --> 00:15:57.620 but it has a lot of scientific kind of safety issues.

276 00:15:57.620 --> 00:16:00.670 First, many of the particles that are being thought of

277 00:16:00.670 --> 00:16:01.940 as candidate particles

278 00:16:05.050 --> 00:16:08.060 for aerosol injection

279 00:16:08.970 --> 00:16:12.513 might have the tendency to deplete our ozone layer.

280 00:16:13.580 --> 00:16:16.400 Some estimates say that, for example,

281 00:16:16.400 --> 00:16:20.310 the closing of the ozone hole

282 00:16:20.310 --> 00:16:23.290 would be delayed by about 40 years

283 00:16:23.290 --> 00:16:25.223 by the use of this tactic.

284 00:16:27.440 --> 00:16:30.440 In addition to that, some of the particles

285 00:16:30.440 --> 00:16:35.440 when they fall to earth after that three year initial period

286 00:16:36.240 --> 00:16:38.840 might be pollutants.

287 00:16:38.840 --> 00:16:40.480 Sulfur is not particularly a problem

288 00:16:40.480 --> 00:16:41.560 'cause there's a great deal of that

289 00:16:41.560 --> 00:16:43.390 in the atmosphere anyway,

290 00:16:43.390 --> 00:16:47.090 but some of the other particles might just cause

291 00:16:47.090 --> 00:16:50.609 ordinary particle fallout pollution.

292 00:16:50.609 --> 00:16:52.770 Another big worry,

293 00:16:52.770 --> 00:16:56.590 and this is a worry both for cloud brightening

294 00:16:56.590 --> 00:17:00.240 and for aerosol injection,

295 00:17:00.240 --> 00:17:03.160 is this idea of termination shock

296 00:17:03.160 --> 00:17:05.890 because neither of these things does anything about

297 00:17:05.890 --> 00:17:08.960 the ongoing accumulation of CO2

298 00:17:08.960 --> 00:17:10.733 and other greenhouse gases.

299 00:17:11.980 --> 00:17:16.363 When they're stopped, if they were stopped suddenly,

300 00:17:17.470 --> 00:17:20.230 there would be a big rebound effect

301 00:17:21.300 --> 00:17:23.810 and the temperature of the earth is predicted

302 00:17:23.810 --> 00:17:27.050 to climb incredibly rapidly

303 00:17:27.890 --> 00:17:32.600 if that intervention is stopped all at once.

304 00:17:32.600 --> 00:17:37.600 So it would be absolutely necessary to have in place

305 00:17:38.010 --> 00:17:43.010 some kind of international agreement about how and when

306 00:17:43.480 --> 00:17:47.210 and how gradually to stop the intervention

307 00:17:47.210 --> 00:17:49.470 in order to avoid this termination shock.

308 00:17:49.470 --> 00:17:51.740 There have been models that have looked at this

309 00:17:51.740 --> 00:17:54.640 and said it's not gonna be very hard to do,

310 00:17:54.640 --> 00:17:57.763 but it does require international cooperation.

311 00:18:00.270 --> 00:18:02.480 Another big problem

312 00:18:02.480 --> 00:18:05.460 with both the solar management techniques

313 00:18:05.460 --> 00:18:08.590 is that they're both better at controlling temperature

314 00:18:08.590 --> 00:18:10.290 than they are at controlling

315 00:18:12.670 --> 00:18:16.490 water circulation through the air and in the soils

316 00:18:16.490 --> 00:18:20.100 so that the predictions and these are better modeled

317 00:18:20.100 --> 00:18:23.460 with the stratospheric aerosol injection.

318 00:18:23.460 --> 00:18:24.550 Its prediction is

319 00:18:27.489 --> 00:18:30.140 that if we reach an optimal temperature,

320 00:18:30.140 --> 00:18:34.070 we will reduce total amounts of rainfall

321 00:18:34.070 --> 00:18:36.360 and this reduction is not gonna be uniform

322 00:18:36.360 --> 00:18:37.560 across the planet.

323 00:18:37.560 --> 00:18:41.440 It would particularly affect monsoon in areas

324 00:18:41.440 --> 00:18:44.360 that have monsoon seasons.

325 00:18:44.360 --> 00:18:48.510 In other areas it looks like soil moisture,

326 00:18:48.510 --> 00:18:51.160 which is what you care about for agriculture

327 00:18:51.160 --> 00:18:52.930 would not be that badly affected,

328 00:18:52.930 --> 00:18:55.280 even if rainfall reduces,

329 00:18:55.280 --> 00:18:57.460 the temperature reduction would

330 00:18:57.460 --> 00:19:02.043 make up for the smaller amount of rainfall,

331 00:19:03.960 --> 00:19:06.440 but the point is that there would be global winners

332 00:19:06.440 --> 00:19:08.400 and losers in terms of

333 00:19:09.810 --> 00:19:12.050 potential for interference with agriculture,

334 00:19:12.050 --> 00:19:13.640 potential for drought,

335 00:19:13.640 --> 00:19:17.910 potential for reduction of the amount of monsoon rains,

336 00:19:17.910 --> 00:19:20.770 potential for reduction of the amount of snow pack

337 00:19:20.770 --> 00:19:22.443 in some parts of the world.

338 00:19:24.590 --> 00:19:26.610 There would be other effects too,

339 00:19:26.610 --> 00:19:28.600 the sky would no longer be blue,

340 00:19:28.600 --> 00:19:31.593 the sky would be a kind of diffuse white light.

341 00:19:32.440 --> 00:19:34.360 This would have effect on agriculture,

342 00:19:34.360 --> 00:19:36.980 it would slow down agricultural growth.

343 00:19:36.980 --> 00:19:38.290 On the other hand,

344 00:19:38.290 --> 00:19:42.720 advocates for this think that having the increased CO2

345 00:19:42.720 --> 00:19:46.410 would speed up some kinds of agricultural growth.

346 00:19:46.410 --> 00:19:49.313 So the effects are upped to be mixed.

347 00:19:54.640 --> 00:19:56.760 So this is

348 00:19:56.760 --> 00:19:59.453 extremely controversial,

349 00:20:01.580 --> 00:20:03.560 the threat of ozone depletion,

350 00:20:03.560 --> 00:20:05.120 the threat of termination shock,

351 00:20:05.120 --> 00:20:06.630 and particularly the fact

352 00:20:06.630 --> 00:20:09.740 that there would be international winners and losers

353 00:20:09.740 --> 00:20:11.703 from solar management,

354 00:20:13.390 --> 00:20:15.753 makes it quite controversial.

355 00:20:17.460 --> 00:20:21.250 The fact also that it seems like it would be incredibly

356 00:20:21.250 --> 00:20:24.140 effective at temperature control

357 00:20:24.140 --> 00:20:26.630 and that it's not expensive,

358 00:20:26.630 --> 00:20:31.630 raises other really important kinds of governance issues.

359 00:20:33.120 --> 00:20:35.853 So to make an obvious point,

360 00:20:36.690 --> 00:20:40.480 a single country could do this

361 00:20:40.480 --> 00:20:44.493 and affect the entire temperature of the world.

362 00:20:46.270 --> 00:20:51.270 There have been many, many different kinds of scenarios run,

363 00:20:51.700 --> 00:20:55.760 and there's a big growing literature on governance

364 00:20:55.760 --> 00:20:57.680 of this kind of geoengineering

365 00:20:58.690 --> 00:21:02.970 in which people trot out all kinds of scenarios

366 00:21:02.970 --> 00:21:05.990 of single countries,

367 00:21:05.990 --> 00:21:09.000 or all coalition of countries,

368 00:21:09.000 --> 00:21:11.560 or a widespread

369 00:21:11.560 --> 00:21:15.240 diverse group of climate

370 00:21:15.240 --> 00:21:17.920 change activists

371 00:21:17.920 --> 00:21:21.040 might actually just do this

372 00:21:21.040 --> 00:21:23.720 without any kind of formal permission

373 00:21:23.720 --> 00:21:25.370 from the rest of the world,

374 00:21:25.370 --> 00:21:29.820 or from the countries that are gonna be most affected by it.

375 00:21:29.820 --> 00:21:33.440 And this poses all kinds of threats

376 00:21:34.310 --> 00:21:37.483 to the international order.

377 00:21:39.200 --> 00:21:40.220 Even if

378 00:21:41.270 --> 00:21:42.310 we could come up

379 00:21:42.310 --> 00:21:47.160 with international governance mechanisms

380 00:21:47.160 --> 00:21:50.300 that would control

381 00:21:50.300 --> 00:21:51.950 and

382 00:21:51.950 --> 00:21:53.980 manage the use

383 00:21:56.590 --> 00:21:59.590 of stratospheric aerosol injection, for example,

384 00:21:59.590 --> 00:22:01.050 even if we could do that,

385 00:22:01.050 --> 00:22:03.400 there would be serious political issues

386 00:22:03.400 --> 00:22:07.620 because different countries are gonna have different views

387 00:22:07.620 --> 00:22:10.640 of what optimal temperatures are.

388 00:22:10.640 --> 00:22:12.900 For example, there have been some winners

389 00:22:12.900 --> 00:22:15.800 in terms of agriculture in particular

390 00:22:15.800 --> 00:22:19.710 from the global warming that we've experienced so far,

391 00:22:19.710 --> 00:22:21.240 the growing season has increased

392 00:22:21.240 --> 00:22:24.260 in parts of the global north, for example.

393 00:22:24.260 --> 00:22:25.940 And it may be that

394 00:22:27.580 --> 00:22:29.380 less of a temperature reduction

395 00:22:29.380 --> 00:22:32.990 would be appealing to those countries that have been winners

396 00:22:32.990 --> 00:22:35.943 from the climate change we've so far experienced.

397 00:22:38.110 --> 00:22:43.110 So there is this risk of a single state actor

398 00:22:43.200 --> 00:22:45.380 changing the entire globe,

399 00:22:45.380 --> 00:22:48.890 or of small groups of states doing it,

400 00:22:48.890 --> 00:22:52.453 or of even of independent actors doing it.

401 00:22:53.990 --> 00:22:54.830 And we have

402 00:22:55.720 --> 00:22:57.930 a small

403 00:22:57.930 --> 00:22:59.800 story already

404 00:23:01.811 --> 00:23:06.811 about this risk of accountability for action in this area

405 00:23:07.310 --> 00:23:09.183 in terms of research in the area.

406 00:23:12.030 --> 00:23:15.353 Bill Gates has been funding a study at Harvard,

407 00:23:16.290 --> 00:23:19.520 which is a trial of

408 00:23:19.520 --> 00:23:24.423 aerosol injection, not of sulfur, but of calcium carbonate.

409 00:23:25.870 --> 00:23:27.940 He had a plan with this Harvard group

410 00:23:29.190 --> 00:23:31.170 in the southwest of the United States,

411 00:23:31.170 --> 00:23:34.730 to who loft some balloons

412 00:23:34.730 --> 00:23:38.030 which would spray a small amount of calcium carbonate

413 00:23:38.030 --> 00:23:41.680 to the stratosphere enough to cover

414 00:23:41.680 --> 00:23:44.573 what's been described as about 11 football fields.

415 00:23:46.718 --> 00:23:51.718 And to then send up instruments to measure the effect of

416 00:23:52.953 --> 00:23:57.160 the reflection, the gains to albedo and so on,

417 00:23:57.160 --> 00:24:01.660 just to do a kind of trial run of stratospheric

418 00:24:01.660 --> 00:24:03.420 aerosol injection,

419 00:24:03.420 --> 00:24:08.420 but pandemic related considerations

420 00:24:08.460 --> 00:24:10.510 moved this group to decide

421 00:24:10.510 --> 00:24:12.170 that they weren't gonna do the experiment

422 00:24:12.170 --> 00:24:15.440 in the southwest of the United States after all

423 00:24:15.440 --> 00:24:19.453 and they just kind of up and moved their location to Sweden,

424 00:24:20.620 --> 00:24:23.570 they decided they were gonna launch their balloon in Sweden

425 00:24:25.730 --> 00:24:29.510 and they didn't ask anyone in Sweden.

426 00:24:29.510 --> 00:24:31.170 They didn't get permission

427 00:24:31.170 --> 00:24:34.510 from any local authorities at all and

428 00:24:35.998 --> 00:24:37.310 the Sami people,

429 00:24:37.310 --> 00:24:39.950 the indigenous peoples of the Northern part of Sweden,

430 00:24:39.950 --> 00:24:41.920 they're an indigenous group

431 00:24:41.920 --> 00:24:44.420 that inhabit the whole polar region,

432 00:24:44.420 --> 00:24:46.163 Sweden and Finland and Russia.

433 00:24:48.010 --> 00:24:50.550 They heard about this

434 00:24:52.600 --> 00:24:54.740 test site movement

435 00:24:54.740 --> 00:24:59.150 and even though the first test was just going to be

436 00:24:59.150 --> 00:25:03.780 to fly the balloon and test the aerosol injection mechanism

437 00:25:03.780 --> 00:25:06.000 and it wasn't actually gonna spread any material

438 00:25:06.000 --> 00:25:07.270 into the sky,

439 00:25:07.270 --> 00:25:12.270 the Sami objected and wrote a letter to the research group

440 00:25:12.500 --> 00:25:16.227 at Harvard and their advisory board and said,

441 00:25:16.227 --> 00:25:20.740 "You can't do this, you can't alter the skies above us."

442 00:25:20.740 --> 00:25:24.423 They had a wide range of objections to this.

443 00:25:25.430 --> 00:25:29.470 At the baseline, their fundamental objection

444 00:25:29.470 --> 00:25:33.203 was with the idea of tinkering with nature at all.

445 00:25:34.530 --> 00:25:36.436 The idea that

446 00:25:36.436 --> 00:25:41.436 their view is that nature is there to be adapted to

447 00:25:41.520 --> 00:25:44.650 and that we should not try

448 00:25:44.650 --> 00:25:48.063 to manage the atmosphere, or the globe,

449 00:25:50.040 --> 00:25:53.610 but they also cited a number of other arguments,

450 00:25:53.610 --> 00:25:57.030 especially moral hazard that I'll be talking about

451 00:25:57.030 --> 00:25:58.113 in a moment.

452 00:25:59.290 --> 00:26:01.470 And they were joined by some environmental groups

453 00:26:01.470 --> 00:26:02.450 from Sweden.

454 00:26:02.450 --> 00:26:07.223 The Sami people were affected by fallout from Chernobyl,

455 00:26:08.730 --> 00:26:11.310 which actually killed a lot of the deer

456 00:26:11.310 --> 00:26:16.310 that their whole lifestyle is sort of centered on

457 00:26:16.880 --> 00:26:20.063 the herding and management of these Arctic deer herds.

458 00:26:23.100 --> 00:26:26.270 Chernobyl killed a bunch of the deer and even today

459 00:26:26.270 --> 00:26:29.680 they have to screen deer meat for radiation

460 00:26:29.680 --> 00:26:31.330 before they can eat it.

461 00:26:31.330 --> 00:26:36.330 So they have a history of being affected by

462 00:26:36.950 --> 00:26:39.930 interventions from other countries

463 00:26:40.930 --> 00:26:44.210 and they have been very active

464 00:26:44.210 --> 00:26:47.250 in terms of trying to reduce climate change,

465 00:26:47.250 --> 00:26:51.610 they lobbied Norway to stop investing in fossil fuels,

466 00:26:51.610 --> 00:26:54.130 they sent a group to Standing Rock

467 00:26:54.130 --> 00:26:57.573 to protest the Dakota access pipeline.

468 00:26:58.560 --> 00:27:02.000 So they have been very active in this area

469 00:27:02.000 --> 00:27:05.110 and their activity basically shut down

470 00:27:05.110 --> 00:27:06.320 the Harvard Gates

471 00:27:07.950 --> 00:27:11.897 project, the advisory board got the letter and said,

472 00:27:11.897 --> 00:27:13.910 "These objections are serious.

473 00:27:13.910 --> 00:27:16.370 They're posing a real political problem for us

474 00:27:16.370 --> 00:27:20.120 and so we're not going to do this study yet."

475 00:27:20.120 --> 00:27:22.473 And the study is still on hold.

476 00:27:24.600 --> 00:27:27.110 Gates also, by the way,

477 00:27:27.110 --> 00:27:29.520 is funding direct air carbon capture

478 00:27:29.520 --> 00:27:34.230 and he has been funding a seawater project, which is

479 00:27:35.250 --> 00:27:38.930 designed to do a cloud brightening.

480 00:27:38.930 --> 00:27:41.720 So he is very much a person who has

481 00:27:41.720 --> 00:27:44.070 a great deal of resources

482 00:27:44.070 --> 00:27:47.990 and he is very much in favor of

483 00:27:47.990 --> 00:27:52.630 these technical geoengineering solutions

484 00:27:52.630 --> 00:27:54.760 to the climate change problem

485 00:27:54.760 --> 00:27:58.240 and here we have an example of him acting

486 00:27:58.240 --> 00:28:02.740 with private researchers to do research in this area,

487 00:28:03.820 --> 00:28:04.960 in the sky over Sweden,

488 00:28:04.960 --> 00:28:06.700 without any governance at all,

489 00:28:06.700 --> 00:28:09.930 without any political consultation at all,

490 00:28:09.930 --> 00:28:13.710 let alone permission or input from the local people.

491 00:28:13.710 --> 00:28:14.890 So this is just one

492 00:28:16.740 --> 00:28:20.490 lesson about the possibility of abuse

493 00:28:24.956 --> 00:28:27.373 of these kinds of techniques.

494 00:28:28.350 --> 00:28:32.060 The biggest objection that most people have to

495 00:28:32.060 --> 00:28:35.263 geoengineering is the moral hazard objection.

496 00:28:36.490 --> 00:28:40.180 Basically they say, "If we can geo engineer,

497 00:28:40.180 --> 00:28:43.120 then we will be less motivated

498 00:28:43.120 --> 00:28:46.917 to actually reduce our carbon emissions."

499 00:28:48.400 --> 00:28:50.373 People will say to themselves, "Look,

500 00:28:51.780 --> 00:28:54.980 we can prevent these dramatic results

501 00:28:54.980 --> 00:28:56.730 from temperature change

502 00:28:56.730 --> 00:28:59.390 and that means we don't have to worry as much,

503 00:28:59.390 --> 00:29:03.350 or we don't have to act as quickly to reduce carbon,

504 00:29:03.350 --> 00:29:07.100 lots of problems with that as an outcome, for example,

505 00:29:07.100 --> 00:29:09.150 the CO2 would just continue to build up,

506 00:29:09.150 --> 00:29:12.093 ocean acidification would continue and so on,

507 00:29:13.900 --> 00:29:17.300 but it's more than just a kind of an abstract worry

508 00:29:17.300 --> 00:29:19.563 that people will feel less motivated,

509 00:29:20.450 --> 00:29:22.600 particularly here in the United States,

510 00:29:22.600 --> 00:29:26.660 there is a worry that the same forces that have been funding

511 00:29:27.860 --> 00:29:30.180 climate change disinformation

512 00:29:30.180 --> 00:29:32.370 and have been slowing us down

513 00:29:32.370 --> 00:29:36.590 in terms of changing the way that we produce electricity,

514 00:29:36.590 --> 00:29:38.650 might turn and

515 00:29:39.610 --> 00:29:42.590 suddenly start funding research

516 00:29:42.590 --> 00:29:47.590 and actual interventions in this solar management.

517 00:29:47.760 --> 00:29:51.790 And might actually, following the lead of Bill Gates,

518 00:29:51.790 --> 00:29:52.713 for example,

519 00:29:54.270 --> 00:29:58.670 start touting the benefits of geoengineering

520 00:29:58.670 --> 00:30:03.170 as a way to preserve our existing underlying

521 00:30:04.810 --> 00:30:07.980 greenhouse gas producing economy.

522 00:30:07.980 --> 00:30:12.200 So there's a great deal of worry about this moral hazard

523 00:30:12.200 --> 00:30:13.350 and it's probably

524 00:30:16.279 --> 00:30:21.170 the biggest single objection to the use of geoengineering.

525 00:30:21.170 --> 00:30:23.150 Just last week on the 17th,

526 00:30:23.150 --> 00:30:27.480 there was a global group of about 60 climate scientists

527 00:30:27.480 --> 00:30:29.170 and some governance scholars

528 00:30:29.170 --> 00:30:31.080 who have called for a moratorium

529 00:30:33.355 --> 00:30:36.490 and a international non-use agreement

530 00:30:36.490 --> 00:30:41.063 on solar radiation management and other geoengineering.

531 00:30:43.730 --> 00:30:46.370 And so there is very strong sentiment

532 00:30:47.430 --> 00:30:50.613 to try to stay away from these methods.

533 00:30:55.560 --> 00:31:00.560 We do have a little bit of existing international governance

534 00:31:01.080 --> 00:31:02.510 in this area,

535 00:31:02.510 --> 00:31:05.350 like the Convention on Biodiversity

536 00:31:05.350 --> 00:31:08.450 to which the US is not a party and it's non-binding,

537 00:31:08.450 --> 00:31:12.620 but the Convention on Biodiversity does mention

538 00:31:15.210 --> 00:31:18.530 that we should not be using geoengineering methods

539 00:31:18.530 --> 00:31:22.433 that would affect biodiversity on the planet.

540 00:31:27.510 --> 00:31:29.960 We have a convention on ozone,

541 00:31:29.960 --> 00:31:33.600 which would be implicated if it turns out

542 00:31:34.943 --> 00:31:36.450 that solar management would start

543 00:31:36.450 --> 00:31:39.330 to deplete the ozone layer.

544 00:31:39.330 --> 00:31:43.370 And we have the UN Framework Convention on Climate Change

545 00:31:43.370 --> 00:31:46.920 which doesn't directly address this,

546 00:31:46.920 --> 00:31:50.620 but which could be mobilized to put some governance

547 00:31:50.620 --> 00:31:51.453 and monitoring

548 00:31:53.860 --> 00:31:55.773 provisions in place.

549 00:31:56.760 --> 00:31:58.630 I recommend to you

550 00:31:58.630 --> 00:32:03.630 the Carnegie Climate Governance Initiative website.

551 00:32:04.230 --> 00:32:07.060 The Carnegie Climate Governance Initiative

552 00:32:07.060 --> 00:32:11.230 is basically trying to foment discussions of governance

553 00:32:12.646 --> 00:32:17.510 of geoengineering at all levels, at local levels,

554 00:32:17.510 --> 00:32:21.220 in national government and internationally.

555 00:32:21.220 --> 00:32:24.710 There's also been some international movement toward

556 00:32:25.610 --> 00:32:29.610 thinking about international government of geoengineering.

557 00:32:29.610 --> 00:32:30.873 So for example,

558 00:32:32.230 --> 00:32:35.300 the Paris Peace Forum is creating a global commission

559 00:32:35.300 --> 00:32:38.180 on governance risks from climate overshoot

560 00:32:39.460 --> 00:32:41.960 that is gonna be put together in the coming year

561 00:32:41.960 --> 00:32:45.110 and it's gonna have a lot of global leaders in it,

562 00:32:45.110 --> 00:32:47.370 it's gonna be headed by the former head of the

563 00:32:47.370 --> 00:32:49.690 World Trade Organization, I believe.

564 00:32:49.690 --> 00:32:53.680 The UN General Assembly is actually going to talk

565 00:32:53.680 --> 00:32:58.130 about governance of international geoengineering

566 00:32:59.740 --> 00:33:01.320 in upcoming meetings.

567 00:33:01.320 --> 00:33:05.530 And there has been a resolution that Switzerland

568 00:33:05.530 --> 00:33:08.710 intends to reintroduce, it introduced it years ago,

569 00:33:08.710 --> 00:33:10.090 but it's going to try again

570 00:33:12.010 --> 00:33:14.240 to introduce this resolution

571 00:33:14.240 --> 00:33:18.923 on governance to the UN Environment Assembly.

572 00:33:22.526 --> 00:33:23.830 So

573 00:33:23.830 --> 00:33:27.720 there is a growing recognition

574 00:33:27.720 --> 00:33:32.043 of the need for governance in this area.

575 00:33:33.540 --> 00:33:35.090 The most important

576 00:33:36.360 --> 00:33:38.950 need is research

577 00:33:40.320 --> 00:33:41.153 because

578 00:33:43.570 --> 00:33:46.550 none of these methods that I've described

579 00:33:46.550 --> 00:33:49.820 has been adequately researched at all.

580 00:33:49.820 --> 00:33:54.240 For example, the spray tools that would put

581 00:33:54.240 --> 00:33:58.250 the salt from ocean water into the clouds

582 00:33:58.250 --> 00:33:59.913 have not yet been developed.

583 00:34:03.901 --> 00:34:07.217 There's been plenty of modeling,

584 00:34:07.217 --> 00:34:08.653 but there's been no kind of in the air studies of any kinds

585 00:34:12.610 --> 00:34:17.030 of stratospheric aerosol injection.

586 00:34:17.030 --> 00:34:21.313 The Gates thing would've been the first real trial.

587 00:34:24.070 --> 00:34:25.210 And it does

588 00:34:25.210 --> 00:34:27.923 seem as though,

589 00:34:28.920 --> 00:34:29.880 unless

590 00:34:31.370 --> 00:34:36.370 we are so worried about the possibility of moral hazard,

591 00:34:37.020 --> 00:34:39.520 or about some of the scientific

592 00:34:40.830 --> 00:34:43.760 risks of doing these,

593 00:34:43.760 --> 00:34:46.320 unless we worried about this

594 00:34:46.320 --> 00:34:49.340 that we want entirely to rule out

595 00:34:50.350 --> 00:34:52.920 stratospheric aerosol injection,

596 00:34:52.920 --> 00:34:55.980 we ought to be doing research on it because

597 00:34:58.910 --> 00:35:00.200 it has potential to

598 00:35:01.390 --> 00:35:04.740 inexpensively buy us time

599 00:35:05.740 --> 00:35:08.493 in terms of lowering the globes temperature.

600 00:35:09.570 --> 00:35:12.460 And right now it is really

601 00:35:12.460 --> 00:35:15.163 not researched at all,

602 00:35:16.190 --> 00:35:17.630 there is some worry

603 00:35:20.190 --> 00:35:21.650 that rogue states,

604 00:35:21.650 --> 00:35:26.420 or single powerful states could simply start trying to do it

605 00:35:26.420 --> 00:35:28.870 on the basis of inadequate research

606 00:35:28.870 --> 00:35:30.660 and that would be a big problem.

607 00:35:30.660 --> 00:35:35.537 So there really does need to be some kind of regulation

608 00:35:36.380 --> 00:35:40.450 of research methods and some kind of international agreement

609 00:35:40.450 --> 00:35:43.430 about how and when the research should be done,

610 00:35:43.430 --> 00:35:46.360 unless we wanna make the move to simply say

611 00:35:46.360 --> 00:35:50.220 we're not going ever to do this

612 00:35:50.220 --> 00:35:53.993 no matter how much we overshoot the Paris climate goal.

613 00:35:56.530 --> 00:35:59.293 In the research context in particular, though,

614 00:36:00.680 --> 00:36:02.880 it's gonna be really important to have local

615 00:36:02.880 --> 00:36:04.363 and public participation.

616 00:36:05.350 --> 00:36:09.760 We need complete transparency because at the research phase

617 00:36:09.760 --> 00:36:10.920 this is gonna just be done,

618 00:36:10.920 --> 00:36:13.430 it's not gonna be done at a level

619 00:36:13.430 --> 00:36:16.690 where it'll start to affect global temperature,

620 00:36:16.690 --> 00:36:21.520 or global rainfall, but it will be done in particular areas

621 00:36:21.520 --> 00:36:23.440 over particular populations

622 00:36:23.440 --> 00:36:26.890 and it might have local effects on agriculture.

623 00:36:26.890 --> 00:36:30.500 It might have local short term effects

624 00:36:32.995 --> 00:36:36.990 on water supply and rainfall,

625 00:36:36.990 --> 00:36:38.700 air exchange generally.

626 00:36:38.700 --> 00:36:40.553 So it seems as if,

627 00:36:42.970 --> 00:36:44.660 even to

628 00:36:44.660 --> 00:36:47.960 find out more about the real risks

629 00:36:47.960 --> 00:36:51.280 of this kind of climate intervention,

630 00:36:51.280 --> 00:36:54.690 we need to put in place international rules

631 00:36:54.690 --> 00:36:58.290 that we really don't have right now.

632 00:36:58.290 --> 00:37:02.680 So I've ended earlier than I thought I would,

633 00:37:02.680 --> 00:37:07.080 that's really all I have to say on this subject

634 00:37:08.890 --> 00:37:13.890 and I am happy then to open things up for discussion

635 00:37:13.920 --> 00:37:16.210 and hear what your questions might be,

636 00:37:16.210 --> 00:37:17.930 or what your comments might be.

637 00:37:17.930 --> 00:37:18.763 And we also,

638 00:37:19.650 --> 00:37:23.680 I know that we already have some questions that were sent in

639 00:37:23.680 --> 00:37:26.810 by people at the time that they signed up for this,

640 00:37:26.810 --> 00:37:29.340 so I'm happy to entertain those.

641 00:37:29.340 --> 00:37:31.130 And I think the way we're gonna do them

642 00:37:31.130 --> 00:37:36.070 is we're gonna have you put your questions in the chat

643 00:37:36.070 --> 00:37:40.270 and Laura will address them to me, is that the plan, Laura?

644 00:37:40.270 --> 00:37:41.420 <v Laura>Yes.</v> <v ->Yeah,</v>

645 00:37:43.103 --> 00:37:46.820 or actually I'm gonna slightly modify the plan,

646 00:37:46.820 --> 00:37:48.100 Laura, without telling her,

647 00:37:48.100 --> 00:37:51.330 which is, since we're a small enough group,

648 00:37:51.330 --> 00:37:54.420 I think what you could do is put in the chat

649 00:37:54.420 --> 00:37:56.110 the fact that you have a question

650 00:37:57.190 --> 00:38:00.880 and then Laura can call on people

651 00:38:00.880 --> 00:38:04.970 and you can unmute yourself and just ask your question live.

652 00:38:04.970 --> 00:38:06.520 But Laura has some questions

653 00:38:06.520 --> 00:38:08.320 that were submitted written as well.

654 00:38:09.410 --> 00:38:11.760 <v ->That's great, thank you so much, Steve,</v>

655 00:38:11.760 --> 00:38:15.550 for raising so many really challenging points

656 00:38:15.550 --> 00:38:17.830 that are difficult to address,

657 00:38:17.830 --> 00:38:21.820 but you've really opened an excellent terrain and

658 00:38:22.890 --> 00:38:26.030 identified a number of the scenarios

659 00:38:26.030 --> 00:38:31.030 in which these questions will be considered in the future.

660 00:38:32.040 --> 00:38:35.893 So I'd like to turn to Dr. Dubrow for the first question.

661 00:38:37.380 --> 00:38:38.970 <v ->Okay, thanks.</v>

662 00:38:38.970 --> 00:38:41.240 <v Stephen>Hi Rob.</v> <v ->Hi Steve.</v>

663 00:38:41.240 --> 00:38:44.690 Thanks, it was refreshing to have the seminar

664 00:38:44.690 --> 00:38:49.533 without slides, actually (chuckles), that was courageous.

665 00:38:52.580 --> 00:38:56.190 I see the moral hazard question has been huge

666 00:38:56.190 --> 00:38:59.310 and my direct question to you

667 00:38:59.310 --> 00:39:02.750 is whether the fossil fuel industry

668 00:39:02.750 --> 00:39:04.510 has been pushing soil management

669 00:39:05.460 --> 00:39:08.990 in any ways as a quote, solution?

670 00:39:08.990 --> 00:39:10.523 <v ->Not yet that I know of,</v>

671 00:39:13.300 --> 00:39:16.563 there is speculation in print that it would happen,

672 00:39:19.280 --> 00:39:21.983 but I'm not yet aware of that.

673 00:39:22.993 --> 00:39:24.530 The only person I know of

674 00:39:24.530 --> 00:39:28.650 who's really been funding it has been Bill Gates

675 00:39:29.760 --> 00:39:34.053 and Bill Gates has come in for a lot of criticism.

676 00:39:38.060 --> 00:39:42.300 He's funded this direct air capture project

677 00:39:42.300 --> 00:39:43.900 that's happening in Canada,

678 00:39:43.900 --> 00:39:45.460 where they're actually already

679 00:39:45.460 --> 00:39:47.520 sucking a small amount of carbon outta the air

680 00:39:47.520 --> 00:39:49.500 and that's great,

681 00:39:49.500 --> 00:39:53.430 but he is really in favor of technical solutions and

682 00:39:55.670 --> 00:39:58.520 is not that interested in addressing

683 00:39:58.520 --> 00:40:00.510 some of the underlying problems of the way

684 00:40:00.510 --> 00:40:02.820 that we sort of do business on the planet.

685 00:40:02.820 --> 00:40:05.430 And in fact, as Bill McKibben

686 00:40:06.370 --> 00:40:10.100 reviewed the Bill Gates climate change book,

687 00:40:10.100 --> 00:40:12.540 I think in the Times, but anyway,

688 00:40:12.540 --> 00:40:17.080 Bill's review basically pointed out that Microsoft

689 00:40:17.080 --> 00:40:19.720 donated tons of money

690 00:40:19.720 --> 00:40:23.720 to politicians who are climate change deniers.

691 00:40:23.720 --> 00:40:26.850 So Gates seems to be one person

692 00:40:26.850 --> 00:40:30.500 who's pushing these technocratic solutions

693 00:40:30.500 --> 00:40:32.800 without really wanting to address underlying

694 00:40:32.800 --> 00:40:34.200 kind of political realities

695 00:40:34.200 --> 00:40:36.383 about how we've gotten into the situation.

696 00:40:37.850 --> 00:40:42.850 I have not heard of any funding from fossil fuel industry,

697 00:40:43.370 --> 00:40:45.940 or the Koch brothers or whatever it might be

698 00:40:45.940 --> 00:40:47.810 of these interventions,

699 00:40:47.810 --> 00:40:51.570 but there is worry in print in multiple articles

700 00:40:51.570 --> 00:40:55.100 that might be the turn they take

701 00:40:55.100 --> 00:40:58.480 if they lose on preventing action on climate change,

702 00:40:58.480 --> 00:41:02.330 they might pivot to say, "Here's what we do.

703 00:41:02.330 --> 00:41:03.460 Let's just lower the temperature,

704 00:41:03.460 --> 00:41:05.360 we could do it in a year, it's cheap."

705 00:41:08.220 --> 00:41:10.920 <v ->Thank you, the next question is from Bruce Jennings,</v>

706 00:41:13.850 --> 00:41:17.033 and Bruce will be speaking in the seminar series as well.

707 00:41:18.720 --> 00:41:21.240 <v ->Thank you very much, Steve, for a very informative</v>

708 00:41:21.240 --> 00:41:24.810 and clear presentation for sure.

709 00:41:24.810 --> 00:41:26.710 I want to

710 00:41:27.580 --> 00:41:31.490 specifically sort of raise a question about

711 00:41:31.490 --> 00:41:35.450 the aspect that has been discussed and that you mentioned

712 00:41:35.450 --> 00:41:40.080 concerning public participation and deliberation

713 00:41:41.200 --> 00:41:45.040 in various approvals of various

714 00:41:46.440 --> 00:41:47.590 experimental trials,

715 00:41:47.590 --> 00:41:51.510 or even in climate governance more generally

716 00:41:53.470 --> 00:41:55.710 because it does interest me

717 00:41:57.230 --> 00:42:02.230 in general what we say about participation.

718 00:42:02.260 --> 00:42:06.830 But before I turn to that one, I just wanted to also note,

719 00:42:06.830 --> 00:42:08.150 I think one of the most,

720 00:42:08.150 --> 00:42:09.780 moral hazard thing is very important,

721 00:42:09.780 --> 00:42:11.900 but another thing that's very important

722 00:42:11.900 --> 00:42:13.150 sort of at the level of

723 00:42:14.860 --> 00:42:17.180 culture and framing

724 00:42:18.960 --> 00:42:21.430 has to do with this sort of eco modernism

725 00:42:22.430 --> 00:42:24.433 Gates type of approach,

726 00:42:25.270 --> 00:42:28.760 versus what I would think would be closer

727 00:42:28.760 --> 00:42:30.770 to the approach that,

728 00:42:30.770 --> 00:42:34.050 the name of this indigenous people, Sami?

729 00:42:34.050 --> 00:42:35.210 <v Stephen>Sami.</v>

730 00:42:35.210 --> 00:42:36.043 <v Bruce>Yeah.</v>

731 00:42:36.043 --> 00:42:38.981 <v ->S-A-M-I, yeah.</v> <v ->Right, so</v>

732 00:42:38.981 --> 00:42:40.580 their position,

733 00:42:40.580 --> 00:42:44.090 which might be called a sort of eco accommodationist,

734 00:42:44.090 --> 00:42:46.690 or adaptationist position if you want to.

735 00:42:46.690 --> 00:42:49.483 Anyway, that debate, I think is very important,

736 00:42:52.190 --> 00:42:55.220 will the same kind of thinking that got us into this problem

737 00:42:55.220 --> 00:42:57.670 in the first place, namely an emphasis on the fact

738 00:42:57.670 --> 00:43:01.690 that human beings can do everything that we decide to do

739 00:43:03.910 --> 00:43:04.880 get us out of it.

740 00:43:04.880 --> 00:43:07.650 And that does seem to me to be a bit of a paradox

741 00:43:07.650 --> 00:43:09.140 worth noting.

742 00:43:09.140 --> 00:43:12.940 On the participation side, I guess, I just think,

743 00:43:12.940 --> 00:43:17.100 or I ask you about some analogies

744 00:43:17.100 --> 00:43:22.100 such as the genetic modification of species of mosquito

745 00:43:23.420 --> 00:43:25.110 using gene drives,

746 00:43:25.110 --> 00:43:29.950 which would lessen the zonanic transmission

747 00:43:29.950 --> 00:43:33.043 of some terrible diseases like Zika and others.

748 00:43:33.940 --> 00:43:34.940 And the

749 00:43:35.800 --> 00:43:38.087 controversy on Florida case

750 00:43:39.340 --> 00:43:40.950 that concerned

751 00:43:42.690 --> 00:43:44.690 a similar kind of effort

752 00:43:44.690 --> 00:43:48.040 to essentially a bioengineer

753 00:43:49.190 --> 00:43:53.253 mosquito populations for the sake of human health.

754 00:43:55.150 --> 00:44:00.080 The participation experience there was

755 00:44:00.080 --> 00:44:05.080 very far from the ideals of deliberative democracy,

756 00:44:05.470 --> 00:44:07.463 transparency, inclusion,

757 00:44:08.560 --> 00:44:11.900 so I just sort of look at things like that

758 00:44:11.900 --> 00:44:16.370 and I see kind of a problematic track record

759 00:44:16.370 --> 00:44:20.670 when it comes to public deliberative democracy

760 00:44:20.670 --> 00:44:24.183 participation, visa vi biotechnology.

761 00:44:27.100 --> 00:44:29.410 I'm not sure why we should be any more optimistic

762 00:44:29.410 --> 00:44:33.320 along those lines when it comes to geo technology.

763 00:44:36.790 --> 00:44:37.623 <v ->Yeah,</v>

764 00:44:40.690 --> 00:44:42.480 I'm proud to say that

765 00:44:43.790 --> 00:44:46.210 my bioethics center here

766 00:44:46.210 --> 00:44:51.090 funded the early days of Natalie Kofler's project

767 00:44:51.090 --> 00:44:52.480 called the Editing Nature,

768 00:44:52.480 --> 00:44:54.870 which is now moved to a different university,

769 00:44:54.870 --> 00:44:58.850 but she's very concerned with trying to promote

770 00:44:58.850 --> 00:45:01.480 more public participation and more transparency

771 00:45:01.480 --> 00:45:04.480 around the bioengineering that you're talking about.

772 00:45:04.480 --> 00:45:06.460 She's concerned with,

773 00:45:06.460 --> 00:45:08.850 there's genetic modification of mosquitoes,

774 00:45:08.850 --> 00:45:11.430 but there's also genetic modification of plant life,

775 00:45:11.430 --> 00:45:13.773 for example, that might spread.

776 00:45:16.200 --> 00:45:17.390 Her whole project

777 00:45:19.340 --> 00:45:22.290 is to improve kind of public input

778 00:45:23.370 --> 00:45:26.850 and public permission for some of these experiments.

779 00:45:26.850 --> 00:45:28.373 But I will say,

780 00:45:29.480 --> 00:45:33.503 the reason that she's busy is these things have,

781 00:45:34.570 --> 00:45:36.770 the efforts of public participation

782 00:45:36.770 --> 00:45:38.820 have not been particularly strong.

783 00:45:38.820 --> 00:45:42.683 And I kind of share your pessimism, I mean,

784 00:45:49.604 --> 00:45:51.090 I think it is

785 00:45:51.090 --> 00:45:54.730 really important as a principle

786 00:45:56.690 --> 00:45:59.120 for us to consult with people

787 00:45:59.120 --> 00:46:02.740 who are gonna be affected by our research.

788 00:46:02.740 --> 00:46:04.770 It's the same kind of thing that we talk about

789 00:46:04.770 --> 00:46:06.480 when we talk about research on human subjects

790 00:46:06.480 --> 00:46:08.083 in a new population or whatever,

791 00:46:10.080 --> 00:46:10.913 but

792 00:46:14.535 --> 00:46:17.780 there is kind of a NIMBY problem.

793 00:46:17.780 --> 00:46:21.320 You could come up with kind of intervention

794 00:46:21.320 --> 00:46:22.770 that everybody wants for the globe,

795 00:46:22.770 --> 00:46:25.730 but nobody wants to have done on their soil.

796 00:46:25.730 --> 00:46:29.050 So public consultation could turn out to be

797 00:46:33.328 --> 00:46:37.520 a real block to methods that actually could help us

798 00:46:37.520 --> 00:46:38.753 with climate change.

799 00:46:39.780 --> 00:46:42.070 And also the public participation

800 00:46:42.070 --> 00:46:43.930 if it's being run by the people

801 00:46:43.930 --> 00:46:46.150 who are doing the experiments,

802 00:46:46.150 --> 00:46:51.150 is apt to be kind of flimsy and lane on the flip side.

803 00:46:51.250 --> 00:46:56.250 So I think you put your finger on a really serious problem.

804 00:46:58.400 --> 00:47:02.330 And it's also, once we think about actually

805 00:47:02.330 --> 00:47:04.253 implementing any of these things,

806 00:47:06.500 --> 00:47:10.600 these are gonna be global changes brought about

807 00:47:10.600 --> 00:47:13.893 and there's no way to have a full public participation,

808 00:47:15.150 --> 00:47:17.730 except if the whole thing is managed

809 00:47:17.730 --> 00:47:20.850 by some sort of United Nations international body,

810 00:47:20.850 --> 00:47:25.310 in which case there would be some kind of representation

811 00:47:26.520 --> 00:47:28.180 involved.

812 00:47:28.180 --> 00:47:30.570 As to your first point,

813 00:47:30.570 --> 00:47:34.450 I think of it as kind of the Heidegger objection,

814 00:47:34.450 --> 00:47:39.450 Heidegger's essay on technology is all about this idea

815 00:47:39.690 --> 00:47:41.780 that we have gotten to where we are

816 00:47:43.600 --> 00:47:45.950 by thinking of everything in the whole world

817 00:47:45.950 --> 00:47:50.950 as a resource to split open and take the energy out of and

818 00:47:51.580 --> 00:47:56.540 he is very skeptical in that essay about the idea

819 00:47:56.540 --> 00:48:01.400 that all of the kinds of social and other problems

820 00:48:01.400 --> 00:48:04.430 that this technological attitude have engendered

821 00:48:04.430 --> 00:48:06.903 can be technique out of.

822 00:48:08.040 --> 00:48:11.950 So it's just another way to put your point

823 00:48:11.950 --> 00:48:16.030 that we should be skeptical that we can

824 00:48:17.670 --> 00:48:20.040 use the same methods

825 00:48:20.040 --> 00:48:22.550 to get out of this climate change problem

826 00:48:22.550 --> 00:48:24.860 that got us into it in the first place.

827 00:48:24.860 --> 00:48:25.970 I also think that

828 00:48:28.390 --> 00:48:30.230 there's something powerful to the notion

829 00:48:30.230 --> 00:48:33.540 that we just shouldn't, that it's hubris,

830 00:48:33.540 --> 00:48:35.300 not as a matter of actual risk,

831 00:48:35.300 --> 00:48:39.150 but just that we shouldn't be engaged in trying to

832 00:48:39.150 --> 00:48:44.150 manage the globe, but against that people say, "Well,

833 00:48:44.780 --> 00:48:46.090 there's no part of the globe

834 00:48:46.090 --> 00:48:50.493 that we haven't already adulterated one way or another.

835 00:48:51.630 --> 00:48:54.709 There is no pristine part of the planet,

836 00:48:54.709 --> 00:48:59.370 there's no nature that isn't affected by us already."

837 00:48:59.370 --> 00:49:00.203 And so

838 00:49:02.551 --> 00:49:04.810 maybe geoengineering is not so different

839 00:49:04.810 --> 00:49:06.860 from what we've already done by accident.

840 00:49:08.420 --> 00:49:09.363 Thank you, Bruce.

841 00:49:10.380 --> 00:49:12.140 <v ->Thank you, Bruce and Steve.</v>

842 00:49:12.140 --> 00:49:14.950 And into the next question, Steve, you mentioned hubris

843 00:49:14.950 --> 00:49:18.080 and I'd just like to ask you very briefly on that point,

844 00:49:18.080 --> 00:49:22.410 in biomedicine we have a very long history

845 00:49:22.410 --> 00:49:27.250 of hubris leading to subsequent experimentation

846 00:49:27.250 --> 00:49:30.320 proving that there are unpredicted adverse events

847 00:49:31.340 --> 00:49:35.730 that lead to outcomes that could not have been predicted.

848 00:49:35.730 --> 00:49:37.640 And when this is all experimental,

849 00:49:37.640 --> 00:49:39.990 I'm wondering if you'd like to speak to that dimension

850 00:49:39.990 --> 00:49:41.263 of the ethics as well.

851 00:49:42.380 --> 00:49:45.260 <v ->Well, I think hubris is actually used in the letter</v>

852 00:49:45.260 --> 00:49:46.793 from the Sami people.

853 00:49:53.520 --> 00:49:56.460 I wanna say that there are two ways of thinking about

854 00:49:56.460 --> 00:49:58.450 what hubris is,

855 00:49:58.450 --> 00:49:59.670 one is

856 00:50:02.050 --> 00:50:04.110 that it's just a species of overconfidence,

857 00:50:04.110 --> 00:50:05.420 that it's just like,

858 00:50:05.420 --> 00:50:08.620 we're sure we can wade into this problem and solve it.

859 00:50:08.620 --> 00:50:12.560 And then we learn time and time again that when we do that

860 00:50:12.560 --> 00:50:16.373 we get smacked with unanticipated consequences.

861 00:50:17.590 --> 00:50:21.170 And so there that when you say that there's hubris,

862 00:50:21.170 --> 00:50:22.840 what you're saying is

863 00:50:25.660 --> 00:50:28.883 we will bring about unanticipated consequences,

864 00:50:31.010 --> 00:50:32.550 but there's another way to think about hubris,

865 00:50:32.550 --> 00:50:34.680 which is maybe a

866 00:50:36.220 --> 00:50:37.790 deeper, which is

867 00:50:39.380 --> 00:50:43.003 it's just inappropriate for us to take that role on,

868 00:50:44.230 --> 00:50:46.613 even if we could do it beautifully,

869 00:50:47.610 --> 00:50:52.610 it's just wrong for human beings to try to

870 00:50:55.310 --> 00:50:57.253 load it over all creation.

871 00:51:00.190 --> 00:51:03.950 So and both those kinds of objections

872 00:51:04.800 --> 00:51:06.910 are out there and talked about quite a bit

873 00:51:06.910 --> 00:51:09.293 in the literature on geoengineering.

874 00:51:10.520 --> 00:51:12.090 <v ->Thank you so much.</v>

875 00:51:12.090 --> 00:51:14.143 Ethan Sims has the next question.

876 00:51:16.200 --> 00:51:17.330 <v ->Thank you very much.</v>

877 00:51:17.330 --> 00:51:18.670 So my question is,

878 00:51:18.670 --> 00:51:23.090 should we be any more optimistic about relying on

879 00:51:23.090 --> 00:51:26.380 governmental organizations to change policy

880 00:51:26.380 --> 00:51:28.240 that's going to lead to reduction

881 00:51:28.240 --> 00:51:30.460 of fossil fuel consumption,

882 00:51:30.460 --> 00:51:34.310 then innovators leading to techniques

883 00:51:34.310 --> 00:51:36.693 that lead to temperature reduction?

884 00:51:37.680 --> 00:51:40.090 I think your question about hubris is

885 00:51:41.140 --> 00:51:43.430 really a question about trusting scientific method

886 00:51:43.430 --> 00:51:47.330 and realizing that science is not without consequences.

887 00:51:47.330 --> 00:51:50.460 And we do our best to analyze the pros and cons of anything

888 00:51:50.460 --> 00:51:51.510 before we take it on.

889 00:51:52.400 --> 00:51:55.400 But I fear that we are approaching a true existential crisis

890 00:51:55.400 --> 00:51:58.050 where we're going to reach irreversible damage

891 00:51:58.050 --> 00:51:58.883 to the planet,

892 00:52:00.170 --> 00:52:02.030 significant human health impacts

893 00:52:02.030 --> 00:52:05.160 from the rapidly progressive climate change.

894 00:52:05.160 --> 00:52:08.430 And if we don't do some sort of mitigation

895 00:52:08.430 --> 00:52:11.050 in terms of not just how it impacts us,

896 00:52:11.050 --> 00:52:14.880 but reducing the rapid increase spread

897 00:52:14.880 --> 00:52:16.810 that we have caused,

898 00:52:16.810 --> 00:52:19.363 that we're going to reach an unsustainable future.

899 00:52:20.690 --> 00:52:25.690 And I think your point about the sort of UN type body

900 00:52:26.130 --> 00:52:26.963 is a good one

901 00:52:26.963 --> 00:52:29.710 because I wish there was a global governing organization

902 00:52:29.710 --> 00:52:31.180 that had respect

903 00:52:32.400 --> 00:52:36.760 and really credibility throughout the world

904 00:52:36.760 --> 00:52:38.230 that could take the lead on this,

905 00:52:38.230 --> 00:52:39.670 but I'm not sure that there is.

906 00:52:39.670 --> 00:52:44.540 So my question is sort of can we afford to ignore that

907 00:52:44.540 --> 00:52:46.870 because my optimism is much lower

908 00:52:46.870 --> 00:52:48.630 that we're gonna have a governmental solution

909 00:52:48.630 --> 00:52:51.130 than that we're gonna have an innovative solution?

910 00:53:00.370 --> 00:53:01.293 <v ->Yeah,</v>

911 00:53:07.490 --> 00:53:09.330 I don't expect it to be govern,

912 00:53:09.330 --> 00:53:12.850 governments that are developing and

913 00:53:15.960 --> 00:53:17.173 making these things.

914 00:53:18.320 --> 00:53:19.940 I do expect governments

915 00:53:19.940 --> 00:53:22.030 who are very concerned about climate change

916 00:53:22.030 --> 00:53:24.750 to make pots of money available to private researchers

917 00:53:24.750 --> 00:53:26.250 to do these kinds of things.

918 00:53:26.250 --> 00:53:28.300 But that's separable from the question of

919 00:53:29.770 --> 00:53:31.450 how it should be overseen.

920 00:53:31.450 --> 00:53:33.120 I mean, I do expect it to be

921 00:53:33.120 --> 00:53:34.810 independent scientific innovators

922 00:53:34.810 --> 00:53:36.250 who come up with the best methods

923 00:53:36.250 --> 00:53:38.170 for doing this kind of stuff.

924 00:53:38.170 --> 00:53:40.070 And I also share your pessimism,

925 00:53:40.070 --> 00:53:43.210 I think we're close to an existential crisis.

926 00:53:43.210 --> 00:53:45.730 And one thing that's happened in the literature

927 00:53:45.730 --> 00:53:47.010 is 10 years ago,

928 00:53:47.010 --> 00:53:50.110 if you talked about geoengineering at all,

929 00:53:50.110 --> 00:53:52.740 everybody jumped down your throat and said, "No,

930 00:53:52.740 --> 00:53:55.110 we can never do that, that's the wrong solution.

931 00:53:55.110 --> 00:53:58.210 What we need to do is change the way we produce energy,

932 00:53:58.210 --> 00:54:01.320 change the way we construct our buildings,

933 00:54:01.320 --> 00:54:03.207 we need to reduce emissions."

934 00:54:04.790 --> 00:54:09.790 And we're now at a time when we've so failed to do that,

935 00:54:10.693 --> 00:54:14.110 even if we keep our Paris promises,

936 00:54:14.110 --> 00:54:17.520 which there's no sign of being able to do,

937 00:54:17.520 --> 00:54:20.250 even if we keep those commitments that were made

938 00:54:20.250 --> 00:54:22.518 in the Paris agreement,

939 00:54:22.518 --> 00:54:27.518 we're headed toward overshooting the temperature goal.

940 00:54:28.470 --> 00:54:30.520 So now talk about geoengineering

941 00:54:30.520 --> 00:54:32.070 is becoming more and more common

942 00:54:32.070 --> 00:54:34.500 and there are people calling out for it

943 00:54:34.500 --> 00:54:36.790 at the same time as there are still a bunch of voices

944 00:54:36.790 --> 00:54:38.240 saying we shouldn't touch it,

945 00:54:38.240 --> 00:54:40.490 particularly the solar management side of it.

946 00:54:42.100 --> 00:54:46.260 So that's a long answer, but I share your pessimism,

947 00:54:46.260 --> 00:54:47.790 which is why own position

948 00:54:47.790 --> 00:54:51.940 is that we should move very quickly

949 00:54:51.940 --> 00:54:54.650 to develop governance in the United States

950 00:54:54.650 --> 00:54:56.000 and internationally

951 00:54:58.210 --> 00:55:00.010 for the research

952 00:55:00.010 --> 00:55:03.190 so that we can figure out if these things can help us

953 00:55:03.190 --> 00:55:07.353 if we reach a really big crisis in the next decade.

954 00:55:12.140 --> 00:55:14.453 <v ->Our next question is to Kyle Ferguson.</v>

955 00:55:16.743 --> 00:55:18.550 <v ->Hi, Steve.</v>

956 00:55:18.550 --> 00:55:20.013 Thanks so much for the talk.

957 00:55:21.770 --> 00:55:24.520 So my question's about the moral hazard argument

958 00:55:24.520 --> 00:55:29.510 when it's used as an objection to conducting research

959 00:55:29.510 --> 00:55:32.060 on any of these strategies.

960 00:55:32.060 --> 00:55:34.270 I'm wondering if you think that argument,

961 00:55:34.270 --> 00:55:37.380 the moral hazard argument changes shape

962 00:55:37.380 --> 00:55:41.140 when it's directed at field trials

963 00:55:41.140 --> 00:55:45.980 as opposed to the sort of computer modeling research

964 00:55:45.980 --> 00:55:48.800 that has been taking place for a long time,

965 00:55:48.800 --> 00:55:50.850 why would the argument look any different

966 00:55:51.900 --> 00:55:53.590 if it's at the field trial phase

967 00:55:53.590 --> 00:55:57.210 as opposed to the pre-field trial phases,

968 00:55:57.210 --> 00:55:58.980 or why would it be any stronger,

969 00:55:58.980 --> 00:56:00.950 or weaker depending on what

970 00:56:00.950 --> 00:56:02.700 phase of research it's directed at?

971 00:56:10.890 --> 00:56:13.290 <v ->Well, I'm not sure that it is stronger,</v>

972 00:56:13.290 --> 00:56:14.350 or weaker as an argument,

973 00:56:14.350 --> 00:56:17.320 I think the people who are very concerned with moral hazard

974 00:56:17.320 --> 00:56:20.763 probably wish that the modeling had been going on.

975 00:56:23.990 --> 00:56:27.340 There's one sense in which it might be stronger though,

976 00:56:27.340 --> 00:56:32.340 which is that a field trial might show that this would work,

977 00:56:34.450 --> 00:56:37.070 it might definitively show, hey, look,

978 00:56:37.070 --> 00:56:41.360 this reflects a lot and it stays up there

979 00:56:41.360 --> 00:56:44.180 for the amount of time that we thought it would

980 00:56:44.180 --> 00:56:47.969 and if we use this material,

981 00:56:47.969 --> 00:56:50.653 we're not seeing any ozone depletion.

982 00:56:51.951 --> 00:56:54.230 The right kind of field trial might

983 00:56:56.450 --> 00:57:00.693 show that this is seriously available as a tool.

984 00:57:01.720 --> 00:57:06.600 And just showing that might be enough to, for example, cause

985 00:57:08.760 --> 00:57:11.690 the fossil fuel industry to run out

986 00:57:11.690 --> 00:57:13.360 and pour a whole bunch of funding into it

987 00:57:13.360 --> 00:57:14.900 and start us down this path.

988 00:57:14.900 --> 00:57:17.253 So there's a sense in which a field trial,

989 00:57:18.240 --> 00:57:19.520 the moral hazard argument

990 00:57:21.180 --> 00:57:26.163 is more urgently directed at field trials for that reason.

991 00:57:30.940 --> 00:57:31.773 <v ->Thank you.</v>

992 00:57:31.773 --> 00:57:34.773 I'd like to give the final question to Sappho Gilbert.

993 00:57:37.440 --> 00:57:41.980 <v Sappho>Hi, it was more a comment than a question, sorry.</v>

994 00:57:41.980 --> 00:57:45.080 I just wanted to say thanks to Steve for a great talk

995 00:57:45.080 --> 00:57:48.130 and just make mention of the opaqueness

996 00:57:48.130 --> 00:57:53.050 and undemocratic nature of the status quo in representation.

997 00:57:53.050 --> 00:57:56.404 But yeah, looking forward to a brighter future perhaps.

998 00:57:56.404 --> 00:58:00.033 <v ->(laughs) A wider sky.</v>

999 00:58:03.900 --> 00:58:06.850 <v ->Thank you, Steve, for a really riveting conversation</v>

1000 00:58:06.850 --> 00:58:09.560 into everyone for your engagement.

1001 00:58:09.560 --> 00:58:11.060 This has been fascinating

1002 00:58:11.960 --> 00:58:14.310 and we'll see what happens (chuckles).

1003 00:58:14.310 --> 00:58:15.763 <v ->Yes, yes, we will.</v>

1004 00:58:17.120 --> 00:58:18.110 Thank you everybody,

1005 00:58:18.110 --> 00:58:20.160 I'm sorry I didn't get a chance to answer

1006 00:58:21.347 --> 00:58:22.220 all of the questions.

1007 00:58:22.220 --> 00:58:23.700 And please do note in the chat

1008 00:58:23.700 --> 00:58:26.490 that Laura's gonna give a talk in this series

1009 00:58:26.490 --> 00:58:29.960 and Bruce Jennings is gonna give a talk in this series.

1010 00:58:29.960 --> 00:58:31.973 So please join us again.