

Showing climate messages in IPCC graphs

Recommendations from
international practitioners
and policy makers

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Abstract

The challenge

Curbing climate change involves making informed policy choices. Therefore, the Intergovernmental Panel on Climate Change (IPCC) shares findings from climate science with practitioners and policy makers around the world. The graphs in IPCC reports show important information but tend to be quite complex and require text to explain them. Yet, these graphs need to stand on their own because readers tend to look at visuals first. They also need to stand on their own because the graphs are frequently shared on their own, out of context.

The project

In this project, researchers from the University of Southern California worked with communication experts at the IPCC and United Nations Foundation to inform the design of IPCC graphs. Practitioners and policy makers from 12 different countries were interviewed. They all had college degrees, but not always in climate science. They viewed ²three graphs drafted for the next IPCC report.

The findings

Participants knew the IPCC and wanted to help. They suggested two types of improvements, which aligned with the graph design literature. First, they suggested that each graph convey one clear message. This involves *hard choices* about what to show in the graph and what to leave for the text. Second, participants suggested *easier fixes*. They said it would help readers to have labels, titles and captions that state what the graphs mean. They also suggested using simple wording, and using colors and fonts that are easy to see. This report was written at U.S. grade level 7, to show what simple wording looks like.¹

The output

We present a checklist to inform the design of graphs that target practitioners and policy makers.

Study team

Wändi Bruine de Bruin is a professor at USC and the lead of this project. She works at the USC Price School of Public Policy and the USC Dornsife Department of Psychology. In 2018, she tested graphs for the United Kingdom's Met Office UKCP18 report.

Lila Rabinovich did the interviews and the initial analyses. She is a researcher and trained interviewer at the USC Dornsife Center for Economic and Social Research.

Kate Weber, Rachel Wald and Marianna Babboni of the Public Exchange at USC Dornsife coordinated the project. They work with public and private sectors to solve complex problems.

Lance Ignon advised on how to communicate our findings. He is USC Dornsife's Senior Associate Dean of Strategic Initiatives and Communication. He worked as a communication consultant for the UN Foundation and the IPCC.

Sigourney Luz and Renee van Diemen at the IPCC led the choice of graphs to be tested, and drafted interview questions. They are communication and science experts respectively for IPCC Working Group III.

Justin Kenney and Fatimah Alyas at the UN Foundation helped to recruit participants. They are experts in climate communications who work closely with the IPCC.

1. To check the reading level of a text (Flesch-Kincaid Grade Level), select the text in Word. Then go to File > Options > Proofing > Show readability statistics (see [instructions](#)). The communications literature suggests writing text at the 7th grade reading level, using shorter words and sentences, and avoiding technical terms (see [Wong-Parodi et al. Energy Policy 2013](#)).

The challenge of creating IPCC graphs

Curbing climate change involves making informed policy choices. Therefore, the Intergovernmental Panel on Climate Change (IPCC) shares findings from climate science with practitioners and policy makers around the world. IPCC reports include a Summary for Policymakers (SPM). The graphs in the SPMs need to stand on their own because readers tend to look at visuals first. IPCC graphs also need to stand on their own because they are frequently shared on their own, out of context.²

In a project with the UK Met Office, we found that policy makers can find climate graphs quite overwhelming.³ In part, this is due to policy makers having no background in climate science. It is also due to the graphs being complex. Studies have shown that graphs are easier to understand if they have one clear key message.⁴ Showing a lot of detail can muddle the key message and confuse the reader. Thus, graph design involves difficult choices about what to show in the graph, and what to leave for the SPM text or the main report.⁵

This project sought feedback from users of IPCC graphs, who wanted to help

Feedback from users can help to make graphs more user-friendly.⁶ We therefore interviewed 20 professionals who worked in climate policy (Table 1) about IPCC graphs. They came from 12 countries around the world. They worked for governments, NGOs, academia and business. They all had college degrees, but many did not have a background in climate science.

Typically, 20 interviews are enough to get useful feedback.⁷ No new comments tend to arise after 10-15 interviews. By interview 15, we reached the point at which we heard no more new comments.⁸

Participants viewed 3 key graphs from the Second Order Draft Summary for Policy Makers (SOD, Fig. 1). In the SOD, these graphs are named SPM6, SPM9, and SPM12. SPM6 showed a line graph with the title “GHG emission trends and projections 2000-2050” (Fig 1A). SPM9 had two panels (Fig 1B). On the left, it showed a table with the title “Feasibility index.” On the right, it showed a line graph with the title “Feasibility challenges of delayed and immediate policy action.” SPM12 showed the “Breakdown of average investment needs until 2030” in two panels (Fig 1C). On the left, it showed this breakdown by sector, in a pie chart. On the right, it showed this breakdown by type of economy, in a pie chart and a bar graph. All participants viewed the graphs in the same order (Fig 1).

Participants were interviewed over Zoom. The interviewer showed each graph by sharing her screen. Each graph was first shown on its own, without any text. Participants commented on the graph. They then rated how easy the graph was to understand, on a scale from 1 (=not easy at all) to 5 (=very easy). Next, participants viewed the graph with a brief description or *caption* shown underneath it. Again, they rated how easy it was to understand. Two members of our team coded the comments that were made about each graph in each interview.⁹

2. O'Neill S et al. *Nature Climate Change* (2015)

3. Kause et al. *Sustainability* (2020)

4. Garcia-Retamero et al. *Human Factors* (2017); Harold et al. *Nature Climate Change* (2016)

5. National Academy of Sciences (2016) *Communicating Science Effectively: A Research Agenda*.

6. Bruine de Bruin & Bostrom PNAS (2013)

7. Morgan et al *Risk Communication: A Mental Models Approach* (2002)

8. For SPM6, this point was reached in interview 15. For SPM9, it was interview 8. For SPM12, it was interview 9.

9. Three transcripts were reviewed by both team members, with 82% agreement. Cohen's (1960) kappa, which corrects for agreement by chance, was 0.70. Disagreements were resolved through discussion.

Table 1: Participant characteristics

WORK PLACE	FIELD OF UNIVERSITY DEGREE	COUNTRY	
9 government	12 policy, law, other social sciences or humanities	6 United States	1 United Kingdom
4 NGO		2 Lebanon	1 Brazil
4 government and NGO	3 physics	2 Ethiopia	1 United Arab Emirates
2 academia	3 engineering	2 Colombia	1 Chad
1 corporate	2 environmental science	1 Kenya	1 Germany
		1 China	1 Rwanda

Fig 1: The three graphs, (A) SPM6 and (B) SPM9, and (C) SPM12

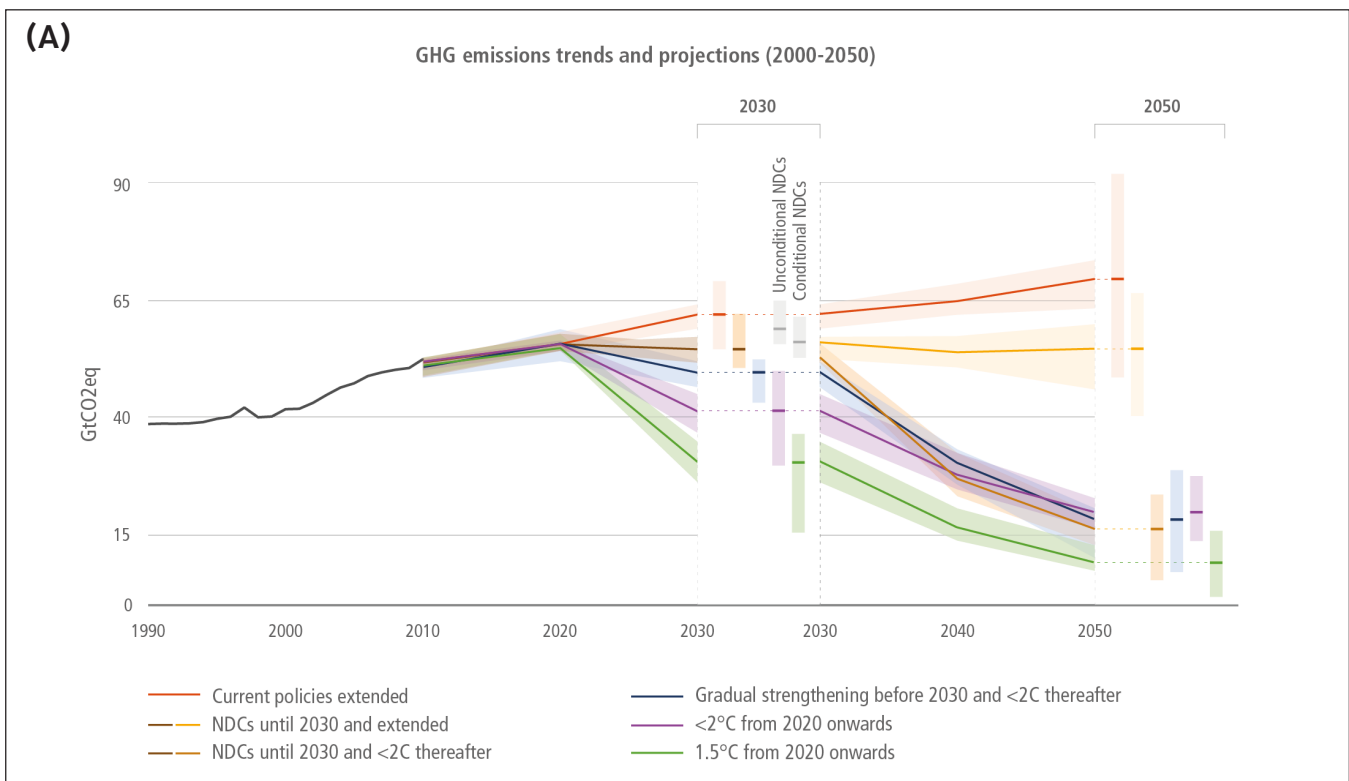


Figure SPM.6: Aggregate GHG emission outcomes of NDCs and long-term mitigation pathways consistent with global temperature limits.

Shown are emission ranges that would emerge from the implementation of current unconditional and conditional NDCs (grey bars) and global pathways from the AR6 scenario database that can be grouped into six types:

- pathways with near-term emissions developments in line with (1) current policies and (2) NDCs, respectively, and extended with comparable ambition levels beyond 2030,
- pathways holding warming below 2°C (66% chance) with near term emissions developments reflecting (3) ambition levels in current NDCs and (4) a gradual strengthening of mitigation action beyond NDCs, respectively, and
- mitigation pathways undertaking immediate action from 2020 onwards towards (5) holding warming below 2°C (66% chance) and (6) limiting warming to 1.5°C by 2100 with low (<0.1°C) overshoot (50% chance), respectively.

The figure shows the emission pathways until 2050 (median and 25th-75th percentiles) with their emissions ranges in 2030 and 2050 broken out in full (median and 5th-95th percentiles). Projected emissions for the NDCs from Section 4.2.2 (Table 4.1) show median and full range.

Notes: GHG emissions are expressed in CO₂-equivalent based on 100-year GWPs from AR6. The NDC estimates are based on the first round of submission to the UNFCCC and do not include recent updates most notably those that have been submitted since November 2020. Historical GHG emissions are based on Chapter 2 assessment (Section 2.2.2).

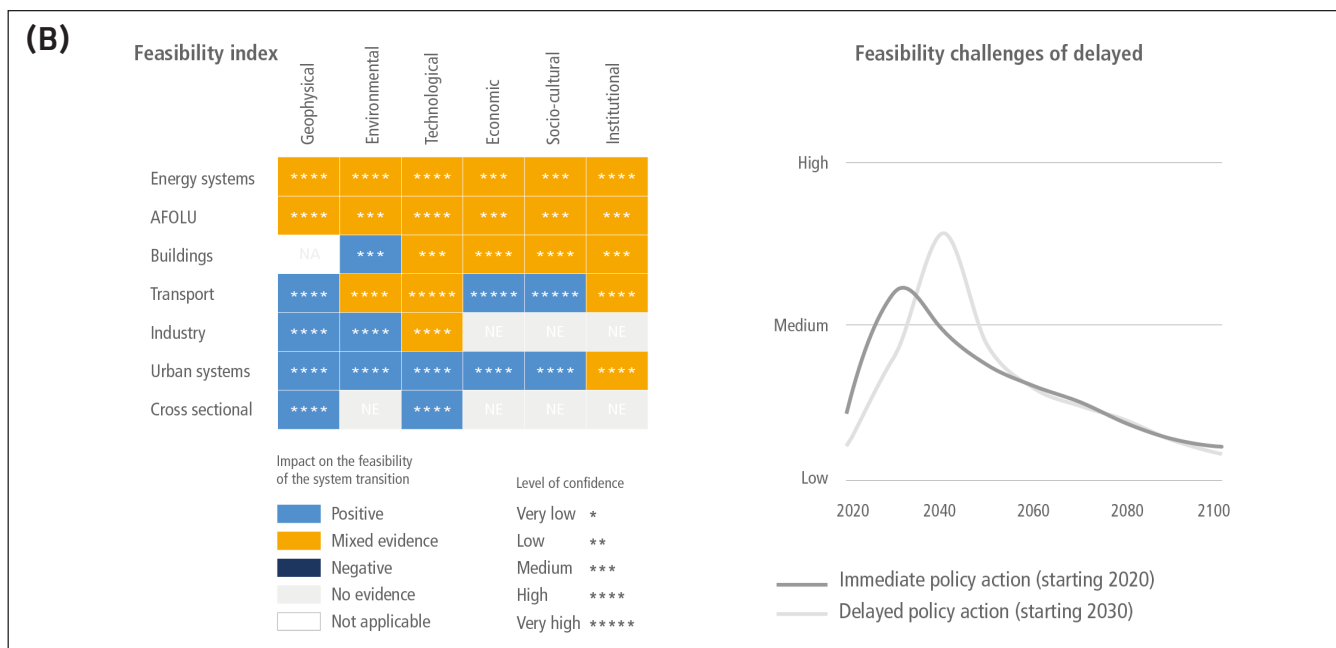


Figure SPM.9 | Feasibility challenges of sectoral transitions and system wide changes: The left panel shows that the feasibility of response options depends on geophysical, environmental, technological, economic, social and institutional enabling conditions and barriers which vary across sectors. The right panel shows the time evolution of a composite indicator of feasibility challenges, aggregating multi-dimensional metrics computed from AR6 scenarios compatible with 1.5-2°C end-of-century temperatures. The 'black' and 'grey' lines represent averages of scenarios with global climate policy starting in 2020 or in 2030 respectively.

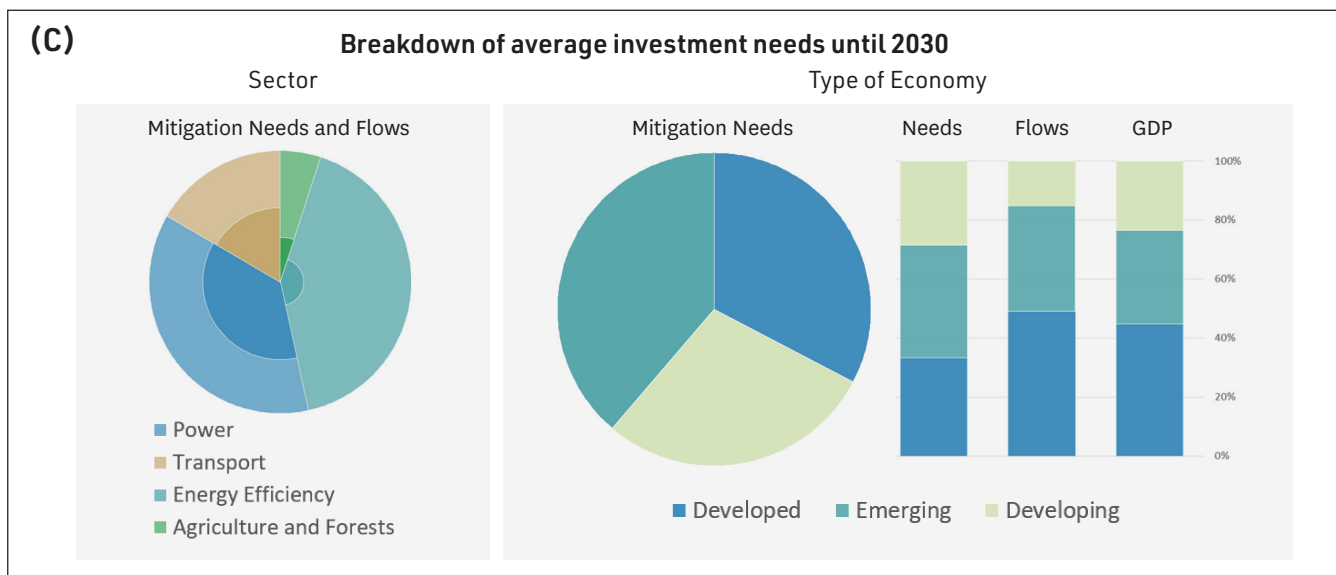


Figure SPM. 12 | Breakdown of average investment needs until 2030

Left chart: Inner boundary represents current flows (mean average of 2017 and 2018), outer boundary represents average mitigation investment needs until 2030. Wing area in between represents resulting finance gaps by sectors. Agriculture and Forests (145 billion USD) based on The Food and Land Use Coalition adjusted for higher afforestation needs based on New Forest Declaration Progress Reports, Energy Efficiency needs (1,099 billion USD) based on IRENA (2020), Electricity sector needs (974 billion USD) based on AR6 IAM database with incremental T&D and Storage needs representing incremental investment needs for Temperature range of 1.75°C–2.25°C over the average of 3.0, 3.5, 4.0 (+/- 0.5°C). Transport needs (425 billion USD) based on estimates for new rail infrastructure of G20 Infrastructure Initiative, no estimates for new EVs available. Flows represent only mitigation pegged flows (incl. multiple objectives, which accounts around 2% of total flows) by sectors provided by CPI. Cross-sectoral flows such as Policy and national budget support & capacity building are excluded (2% of total non-Adaptation flows).

Right chart: Emerging represents BRICS countries. Developing and developed countries by IPCC country classification (UN M49). Flows: Mean average of 2017 and 2018 as per CPI breakdown, trans-regional and non-regional flows (approximately 20% of flows) allocated pro rata. Breakdown of needs for Agriculture and Forests based on current Bonn Challenge commitments due to lack of better data, afforestation needs represent >50% of total needs, Electricity sector by Type of Economy based on AR6 IAM database, Energy Efficiency needs based on IRENA data, Transport needs based on Global Infrastructure Outlook for Rail Infrastructure needs. Total GDP 2018 in constant 2017 international dollars, World Bank Indicator (NY.GDP.MKTP.PP.KD).

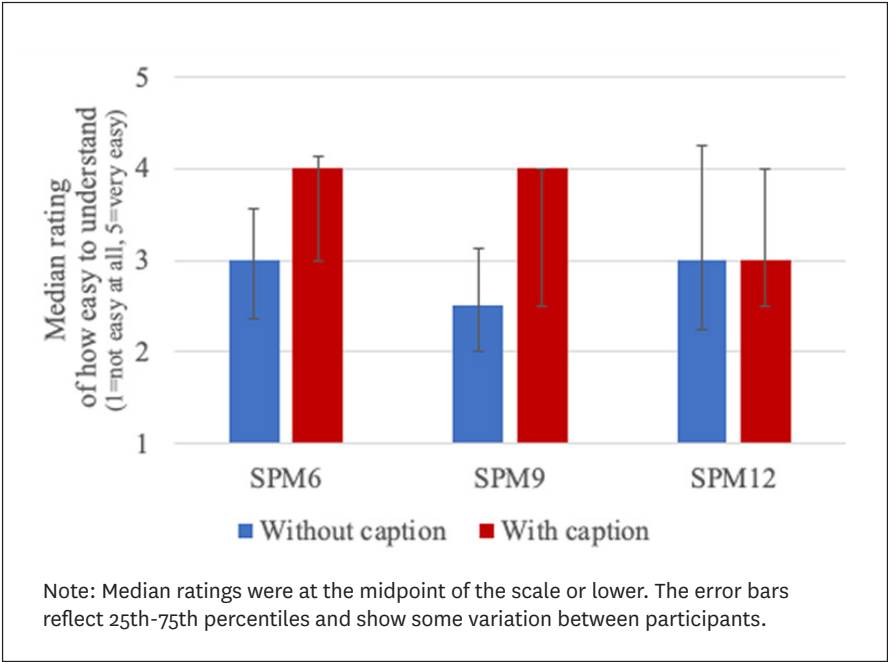
IPCC graphs are important, but not always easy to understand

With one exception, all participants used IPCC findings in their work. They were familiar with IPCC graphs. They wanted to help. Each one talked to us for an hour. Many thanked us for asking them for feedback.

Graphs are an important part of IPCC reports. Twelve participants said that they looked at the graphs before deciding what to read in the main text.

Yet, not all participants found the graphs easy to understand (Fig 2). The median rating for graphs SPM6 and SPM12 was 3. That median rating is at the middle of the scale, which ranged from 1 (=not easy at all) to 5 (=very easy). The median rating of graph SPM9 was the lowest, at 2.5. Median ratings for SPM6 and SPM9 were higher with the caption than without. But for SPM12 the median was unchanged.

Fig 2: The graphs were not easy to understand for everyone, but some captions help



Participants suggested to focus on the key message, which involves hard choices

Participants had suggestions for further improving the graphs (Tables 2-4). One main suggestion was raised for all three graphs: Focus on one clear key message that is relevant for policy makers and practitioners. The key message should state the main point that the graph is trying to make. One participant said: “*The message needs to get out there.*” However, we also heard “*I understand it but [the message] is not explicit,*” “*I’m kind of struggling to grapple with what the take home message is there.*” and “*[this is] too much information.*” For each graph, participants suggested details to remove. Indeed, graphs that show a lot of details can be overwhelming and make the key message hard to see.

Designing clear graphs involves making hard choices about what to show in a graph, and what to leave for the SPM text or the main report. Only IPCC authors can make these hard choices. The IPCC has a lot of information to share. But presenting too much information can make the graph too hard to understand. The comments of our participants may help IPCC authors to make some of the hard choices about how to design the graphs that share the IPCC's key messages.

Participants also suggested easy fixes to make graphs easier to understand

Participants also made comments that involved easy fixes (Tables 2-4). For example, they suggested making sure that all labels, titles, and captions help policy makers and practitioners to understand the graph and key message. One participant said about SPM12: *"The title is a bit indirect."* Another said about the caption of SPM12: *"It's almost like a footnote rather than explaining the graph"* (Table 4C). Instead of treating the caption as a footnote, it could be used to explain what the graph means, and how to interpret all of its parts. Participants suggested avoiding or explaining technical terms and acronyms, such as "GWPs" or even "AR6" (Table 2C). Other simpler fixes were to use more distinct colors and bigger fonts.

Examples of simple graphs

It may be helpful to take a look at the [UNEP](#) graph one participant suggested as an alternative to SPM6. It addresses most of the comments participants had about SPM6 (Table 1A). Its title states the key message: "Greenhouse gas emissions remain far off track for global climate goals." It shows less information. And it uses text boxes to explain why information is shown. Whether or not to follow all or parts of this example, is, of course, for IPCC authors to decide.

As another example, the German news outlet [Deutsche Welle](#) simplified the UNEP graph even further. It shows even fewer scenarios than the UNEP graph. Indeed, members of the media may simplify graphs if what they find in reports is not simple enough for their use. It might be better if they would use the IPCC's graphs. It would allow the IPCC to keep control of the message. But it would require creating simpler graphs.

Graph design check-list

Fig 4 shows a graph design check-list that aims to help address the comments participants made. The items on the check-list are also based on the graph design literature.³ The first set of items encourages graph designers to focus on the key message. These items involve the hard choices about what to present. The second set is about writing clear titles and captions that convey the key message in simple wording. (As an example, this report is written in simple wording.¹) The third set is about using clear labels, colors and fonts. When in doubt, the fourth set is about consulting with the intended users of the graph,² and checking the graph design literature.³ This approach should help to design user-friendly graphs that share key IPCC messages with policy makers and practitioners.

Fig 4: Graph design check-list

GRAPH DESIGN CHECK-LIST

KEY MESSAGE

- ☐ Is there *one* key message shown in each graph?
- ☐ Is the one key message relevant to policy makers?
- ☐ Can the one key message be learned from the graph without reading the caption?
- ☐ Are all details in the graph needed to understand the one key message?
- ☐ Has serious consideration been given to moving details to the main text?

TITLES AND CAPTIONS

- ☐ Is the one key message stated in the title and reiterated in the caption?
- ☐ Are all parts of the graph explained in understandable wording?
- ☐ Are variables referred to in the same wording throughout the title, caption, and legend?
- ☐ Are jargon and acronyms avoided or clearly explained?

GRAPH

- ☐ Are the colors easy to distinguish?
- ☐ Are the font sizes large enough?
- ☐ Are all axes labeled in understandable units and wording?
- ☐ Are all colors in the legend?
- ☐ Are all parts of the graphs labeled and explained in understandable wording?

INPUT

- ☐ Were members of the target audience consulted?
- ☐ Was the graph design literature consulted?

Note

This graph design check-list reflects comments on climate change visualizations from practitioners and policy makers as well as the graph design literature ([Garcia-Retamero et al. Human Factors 2017](#); [Harold et al. Nature Climate change 2016](#); [Hill & Millner Accounting Education 2003](#); [Kause et al. Sustainability 2020](#))

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Table 2A: Comments on SPM6 that involve *hard choices* about what to present in the graph

Feedback	Number of participants	Example comments and suggestions
Focus on one clear key message and state it in the title	11	“So, obviously, the title says, it’s GHG emissions trends and projections. I understand it but [the message] is not explicit.” (P1) “This [graph] doesn't feel as good as the UNEP graph [at] sort of capturing very simply the issue.” (P5) “[This is] too much information.” (P6)
Remove or clarify scenarios	8	“There’s too much, too many different scenarios in it.” (P4) “So what is unclear to me is the difference, both visually and what's intended, between the second two categories, NDCs until 2030 and extended and NDCs until 2030 and less than two degrees C thereafter.” (P16) “I was wondering why there was only 5 scenarios up to 2030 and then 6 scenarios thereafter.” (P9)
Remove insets or connect lines	8	“This 2030 sort of inset and 2050 inset, I find that actually more confusing than helpful. Yeah, you know, I sort of understand why you might try putting them in there, but you know, to me anyway, it just makes it harder to read.” (P 7) “If you remove the frozen columns, there’s a perfect graph to be included in the summary for policymakers.” (P8) “The zoom in of the 2030 and the 2050 interrupted my thought of the curves. I like to follow lines, and that was confusing. And because it's very spread out.” (P10)
Remove or clarify un/conditional NDCs in grey	6	“I didn't know these types of NDCs.” (P14) “With the graph, there must be some kind of explanation what those NDC[s are].” (P13) “What I’m not sure to understand is why [...] both the unconditional NDCs and the conditional NDCs appear to be higher than like the NDCs line, the brown NDCs line.” (P1)
Use consistent error bands or explain the inconsistency	3	“What I’m not sure to understand is why the error bars are different in the focus for 2030 and in the before... and even for the 2050? So the error bars are quite large, which is expected. But I don’t know exactly why the error bars are so thin between the years, you see, like between like between 2020 and 2030, and between 2030 and 2050.” (P1)

Table 2B: Comments on SPM6 that involve *easier fixes* in the graph

Feedback	Number of participants	Example comments and suggestions
Use colors that are easier to distinguish	9	“The yellow in the first NDCs and the orangeish-yellow in the second are too similar. It would be easier if you had a more distinct coloration.” (P16)
Avoid or explain jargon and acronyms	1	“When you need to go to [meet] with the President, [...]they don’t understand geoton CO2 equivalent. But they do understand they need to remain under 2 degrees. Or [...] under 1.5.” (P15)
Use larger font	1	“Do the number bigger because old people, we cannot see.” (P15)

Table 2C: Comments on SPM6, which involve *easier fixes* in the caption

Feedback	Number of participants	Example comments and suggestions
Reiterate key message	13	“The message needs to get out there.” (P16) “It’s very confusing if there’s a single message you want to be able to communicate quickly out of this.” (P17)
Explain error bands in a way that is consistent with graph	13	“This median 25 and 75 percentile. This I don’t know. Where is it?” (P14) “So the pathways are 25th to 75th percentile; whereas the ranges in 2030 and 2050 are the 5th and 95th. I guess my kind of question would be why the inconsistency?” (P9)
Explain the scenarios in a way that is consistent with the graph	9	“It doesn’t explain the reason why the two degrees Celsius scenario was chosen for number 3 and number 4.” (P10) “I think that it would benefit from having 6 bullets instead of 3.” (P16) “The 1, 2, 3, 4 that are in parentheses, it would be helpful to also see them in the graph.” (P8)
Explain unconditional and conditional NDCs	8	“So <i>long-term mitigation pathways</i>. Are these different than the NDCs? Because in the graph, there’s not <i>long-term mitigation pathways</i>. [...] This is one I did not understand. The conditional and unconditional NDCs, the gray bars.” (P8)
Avoid or explain jargon and acronyms	5	“It’s kind of in the jargon of the IPCC.” (P7) “I don’t understand the words but maybe it’s my English.” (P15) “There are some things like <i>gradual strengthening of mitigation</i> which are a little vague to me. [...] I sort of understand what <i>overshoot</i> means, but I don’t know that that’s widely understood as a concept.” (P4) “What’s the <i>AR6</i>? And the <i>GWPs</i>?” (P2)
Explain insets	3	“The text did not explain anything about these two frozen columns.” (P8)

Table 3A: Comments on SPM9 that involve *hard choices* about what to present in the graph.

Feedback	Number of participants	Example comments and suggestions
Focus on one clear key message and state it in the title (matrix)	13	“So I’m kind of struggling to grapple with what the take home message is there.” (P9) “The titling could be a little bit better because the point, I don’t think, is about the feasibility challenges. It’s about the impact of the enabling environment on the feasibility of system transitions.” (P17)
Focus on one clear key message and state it in the title (line graph)	8	“I think they could just say that in a sentence. I mean, I assume it’s just making the very simple point that if you delay implementation of these control measures, the feasibility increases some.” (P4)

Table 3B: Comments on SPM9 that involve *easier fixes* in the graph

Feedback	Number of participants	Example comments and suggestions
Clarify types of evidence in matrix	10	“Does positive mean if you delay the feasibility changes go up or down?” (P5) “There's no negative or not applicable [in the matrix], which then begs the question as to why they're in the legend.” (P19) “I see a lot of mixed evidence and I'm not sure what that means even.” (P3) “I don't think you can make these gross generalizations about positive feasibility or mixed evidence or negative. I think it varies within those sectors, within developed or developing countries. To me it's just too aggregate, and therefore not useful.” (P4)
Clarify direction of causality in matrix	8	“Are we looking at the impact of geophysical aspects on the energy systems or of the energy systems on the geophysical conditions of a city? Which way is the flow of the impact?” (P10)
Clearly label vertical axis of matrix	6	“I'd like to see what cross-sectional's defined as.” (P13) “So the [title says] impact on the feasibility of the system transition and the problem is that they're using the word systems on the left side, but I don't think those are the systems that they're transitioning.” (P17)
Clearly label horizontal axis of matrix	5	“It would be really helpful to have more labeling on this figure to figure out what these categories are. I understand the categories energy systems through cross-sectional. I do not understand the categories geophysical through institutional.” (P16)
Clearly label y-axis of line graph	4	“It's only qualitative, and there's only high, medium, and low, there isn't much [information].” (P1)
Clarify levels of confidence in the matrix	5	“I don't know what exactly that means, level of confidence.” (P3) “The confidence doesn't say a lot because you always have three or four stars or sometimes five stars but it's not really a big variation so I'm wondering whether I can really use that. I guess not since it's only qualitative levels and I don't know exactly what's the difference between medium and high or high and very high, how relevant that is. The message of that is very limited.” (P19)

Table 3C: Comments on the caption of SPM9, which involves *easier fixes*

Feedback	Number of participants	Example comments and suggestions
Clarify direction of causality in matrix	5	“So if it’s a sectorial transition, so then you would have a title above energy systems that said, that would say “sectorial transitions.” (P8)
Clarify meaning of the line graph	6	"So as a policymaker what is the message? So it doesn't matter whether I start early or not? It's not really clear. Of course, if I understand, you know I'm looking at it if I start in 2020 it is hard in any case, in 2030 feasibility may increase if I start early on compared to later, that's obvious. Because if I start later then I would be less experience with the feasibility. But what puzzles me is that the feasibility is then going down after 2040 and is on the same level, at a lower level at the second half of the century." (P19)
Clarify types of confidence in matrix	6	“I still don’t understand it. (...) I know that sometimes we need to have levels of confidence, but I don’t think that’s useful here.” (P1)
Clarify types of evidence in matrix	5	“So the key question for me is really to understand what is the positive impact compared to mixed and to negative and that I still don't understand.” (P19)

Table 4A: Comments on SPM12 that involve *hard choices* about what to present in the graph

Feedback	Number of participants	Example comments and suggestions
Focus on one clear key message and state it in the title of left panel	15	“Why are the needs and flows being shown here?” (P6) “So presumably this is the amount of more or less financial resources needed in different sectors.” (P9)
Focus on one clear key message and state it in the title of right panel	10	“The title is a bit indirect.” (P10) “[This] essentially says that the needs are spread equally between developed, emerging, developing, but developed countries get the lion's share or get more than their fair share of the flows.” (P5)
Remove graphs or explain links between multiple graphs	11	“On the right, there’s an apparent redundancy that I cannot wrap my head around.” (P1) “I don't know why you need the pie chart and the bar chart as it were. I think you could probably do away with the pie chart.” (P5) "It's a completely different figure. It's talking about a completely different thing. This is the distribution of the needs and flows per sector and needs and flows by country and country groupings." (P. 17)

Table 4B: Comments on SPM12 that involve *easier fixes* in the graph

Feedback	Number of participants	Example comments and suggestions
Explain inner vs. outer circles in left panel	4	“I mean, the inner circle lacks explanation of the left.” (P1) “What's inner circle versus the outer – I don't know what that is. Why is the dough-nut hole kind of in the middle different-sized for the different sectors?” (P7)
Add units	7	“And it doesn't have any units. So I know that maybe energy efficiency needs more than power, and the agriculture needs the use of investment flows. But I don't know, the scale of investment needs. So are we talking trillions? Billions? How much? There's no scale.” (P8) “So it's no numbers. [...] It doesn't tell me how much I need to invest.” (P15) “[Add numbers] on the left, using the pies, and even maybe in the title in the sense of how much we need in total.” (P1) “It would be a lot easier to understand if there were actual dollar figures inside the different-colored pie-chart pieces.” (P16)
Explain flows	11	“I don't understand exactly what a flow is. I think I know what a investment need is and I can sort of guess at what an investment flow would be.” (P7)
Explain needs	6	“<i>Mitigation needs</i>, is that the total amount that's needed by each of these different – these three groupings of countries? And are we talking about <i>investment needs</i>? Presumably we are, but you know, I mean, <i>mitigation needs</i> to me is how much emission reductions you're gonna need, not financial or investment needs. So I would strongly urge them to put investment back in these graphs not just at the top, right?” (P4)
Explain GDP	6	“GDP, not clear what is this indicator. So we're talking investment per GDP unit? Is it a ratio? Or just is it an indicator?” (P8)
Explain emerging	3	“I don't know if when you're saying emerging, we're talking about emerging countries or emerging needs.” (P20)
Match order in legend and figure	2	“So the order is weird because we're starting down below, and then it's neither clockwise nor counter-clockwise.” (P1) “The key needs to be aligned with the figure and they should correlate, because for colorblind people, you need to be able to figure that out.” (P17)
Use colors that are easy to distinguish	4	“The blue and the green are too similar in color I would argue.” (P9)

Table 4C: Comments on the caption of SPM12, which involves *easier fixes*

Feedback	Number of participants	Example comments and suggestions
Reiterate key message	12	“It’s almost like a footnote rather than explaining the graph.” (P4)
Explain flows and needs	6	“There is no mention of any mitigation need and flow.” (P2)
Explain links between graphs in right panel	6	“There’s a redundancy between like the pie and the first column. From the text, I haven’t figured out if there’s any difference.” (P1)
Explain inner vs. outer circles in left panel	1	“It didn’t differentiate the dark color.” (P2)
Avoid or explain jargon and acronyms	10	“The text confuses me more, 'cause I don't really know what ‘the wing area in between represents resulting finance gaps by sector’ [means].” (P7) “I would encourage you not to use acronyms. Because people are not familiar with acronyms. For example, CPI breakdown.” (P15)
Be consistent across graph and caption	2	“For the left chart they started mentioning sectors that aren’t mentioned inside the pie chart.” (P3) “And the text also doesn’t talk directly to the figure, so they start with agriculture and forests, which is the last in the legend.” (P10)