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# COST ESTIMATE OF A HYBRID PARLIAMENT SYSTEM



OFFICE OF THE PARLIAMENTARY BUDGET OFFICER  
BUREAU DU DIRECTEUR PARLEMENTAIRE DU BUDGET

The Parliamentary Budget Officer (PBO) supports Parliament by providing economic and financial analysis for the purposes of raising the quality of parliamentary debate and promoting greater budget transparency and accountability.

Senator Rosa Galvez requested that the Parliamentary Budget Officer estimate the costs and savings of a hybrid parliamentary system. In such a system, parliamentarians can participate in the proceedings either in person or remotely via videoconference.

This report estimates certain incremental costs (mostly acquisition of IT equipment and increased costs of interpretation services) and the savings (reduction in travel expenses for Senators and Members of the House of Commons that no longer travel to Ottawa to attend in person) of a hybrid parliamentary system.

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# Executive Summary

This report estimates, at the request of Senator Rosa Galvez, the incremental costs and savings of a hybrid parliamentary system. In such a system, parliamentarians can participate either in person or remotely via videoconference. The significant decrease in travel also reduces green house gas (GHG) emissions and as such, this report also attempts to estimate this associated reduction.

Summary table 1 presents the costs and savings of a hybrid parliamentary system, when using the assumption that in-person attendance is similar to that observed during the pandemic since the beginning of the 2<sup>nd</sup> session of the 43<sup>rd</sup> Parliament. As can be seen, over a full year the net savings from a hybrid parliamentary system are estimated at \$6.2 million (including the set-up costs). Looking at the monthly net savings excluding the set-up costs, they are estimated at \$673,000 and therefore, it would take about 2.8 months to recoup the initial set-up costs (the non-recurring costs). It is also estimated that the hybrid parliamentary system would reduce GHG emissions related to travel by about 2,972 metric tons of CO<sub>2</sub> equivalent.

**Summary table 1** Net savings from a hybrid parliamentary system (in-person attendance similar to that during the pandemic)

	<b>(thousands of \$)</b>		
	<b>Senate</b>	<b>House of Commons</b>	<b>Total</b>
Recurring costs	(1,444)	(3,204)	<b>(4,649)</b>
Savings	2,231	10,497	<b>12,728</b>
<b>Net savings (annual - excluding set-up costs)</b>	787	7,293	<b>8,079</b>
Minus: Set-up costs	(400)	(1,498)	<b>(1,898)</b>
<b>Net savings (annual)</b>	387	5,795	<b>6,181</b>
<b>Net savings (monthly - excluding set-up costs)</b>	66	608	<b>673</b>
Number of months necessary to recoup set-up costs	6.1	2.5	<b>2.8</b>
<b>Annual reduction in GHG (metric tons of CO<sub>2</sub> equivalent)</b>	484	2,488	<b>2,972</b>

Source: PBO's calculations

Summary table 2 presents the results under an alternative assumption where half of the members in each chamber would be participating in person.

**Summary table 2** Net savings from a hybrid parliamentary system (half of Senators and MPs participating in person)

	(thousands of \$)		
	Senate	House of Commons	Total
Recurring costs	(1,444)	(3,204)	<b>(4,649)</b>
Savings	1,918	7,058	<b>8,975</b>
<b>Net savings (annual - excluding set-up costs)</b>	473	3,853	<b>4,327</b>
Minus: Set-up costs	(400)	(1,498)	<b>(1,898)</b>
<b>Net savings (annual)</b>	73	2,355	<b>2,429</b>
<b>Net savings (monthly - excluding set-up costs)</b>	39	321	<b>361</b>
Number of months necessary to recoup set-up costs	10.1	4.7	<b>5.3</b>
<b>Annual reduction in GHG (metric tons of CO<sub>2</sub> equivalent)</b>	421	1,618	<b>2,039</b>

Source: PBO's calculations

We can see from Summary table 2 that the net savings over a year would be somewhat smaller if more members are travelling, at \$2.4 million. Lower savings obviously mean it will take more time to recoup the initial costs, estimated at 5.3 months.

Summary table 3 presents the minimum percentage of members participating remotely needed to completely offset (i.e. break-even) the cost of implementing or maintaining a hybrid parliamentary system. For example, if all the equipment required for a hybrid system had to be replaced every three years, the Senate would break-even if 45% of Senators participated remotely in all sittings (or if all Senators reduced their travel to Ottawa by 45%). That number is 29% for the House of Commons.

**Summary table 3** Remote participation required to reach the break-even point

Amortization of set-up costs	Percentage of members participating remotely		Annual reduction in GHG (metric tons of CO <sub>2</sub> equivalent)
	Senate	House of Commons	
One year	53%	37%	1,656
Three years	45%	29%	1,335
Five years	44%	28%	1,270
None (recurring costs only)	41%	25%	1,174

Source: PBO's calculations

# 1. Introduction

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Senator Rosa Galvez requested that the Parliamentary Budget Officer estimate the costs and savings of having a hybrid parliamentary system. In such a system, parliamentarians can participate either in person or remotely via videoconference.

The social distancing measures implemented because of the COVID-19 pandemic restrict Senators and members of Parliament (MP) from being physically present simultaneously in their respective chambers. The House of Commons adopted a motion on September 23, 2020 to allow MPs to attend House proceedings either in person or remotely, and most importantly to allow MPs to participate in votes remotely.<sup>1</sup> The Senate followed suit by adopting a motion on October 27, 2020, that would allow Senators to do the same.<sup>2</sup>

This report estimates the incremental costs (mostly acquisition of IT equipment and increased costs of interpretation services) and the savings (reduction in travel expenses from Senators and MPs that no longer travel to Ottawa to attend in person) of a hybrid parliament system. These costs and savings are broken down between each chamber and are presented on a monthly and annual basis. The significant decrease in travel also reduces green house gas (GHG) emissions and as such, this report also attempts to estimate the associated reduction in GHG as requested by Senator Rosa Galvez.

Note that this report does not attempt to measure the actual costs and savings accrued because of the pandemic, nor do we provide a projection of those same costs and savings. It instead provides an estimate of the costs and savings of having hybrid sittings, regardless of the presence of a pandemic. This has some implications for the methodology, which are detailed in the next section.

## 2. Methodology

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### 2.1 Incremental costs

The Senate administration provided the PBO with some information on the costs of Senate operations since the beginning of the pandemic. The House of Commons (HOC) administration provided the PBO with a copy of the information note on the financial status update of the COVID-19 pandemic that was presented to the Board of the Internal Economy on December 3, 2020. This note contains a breakdown of the incremental costs incurred to operate the HOC since the beginning of the pandemic and up to October 31, 2020.

The most important costs were the acquisition of equipment and overtime paid to staff to provide additional support to parliamentarians participating remotely. Some of these incremental costs are one-time fixed costs<sup>3</sup> like the purchase of large display monitors installed in the middle of the floor in the Senate chamber or mounted in the House of Commons on both sides of the Speaker's chair. Other costs are recurring, such as the salary of the employees occupying the new positions necessary for the operation of videoconference.<sup>4</sup>

Another important cost of operating a hybrid parliamentary system is the increased costs from live interpretation services. Virtual interpretation causes more fatigue to interpreters, who must work shorter shifts, as well as an increase in acoustic injuries. The Translation Bureau, which provides interpretation services to Parliament, has hired additional interpreters on-contract to support its operation because of these issues.<sup>5</sup>

Through information request [IR0542](#), the PBO obtained an estimate of the increased costs of interpretation services provided to parliamentarians. Providing interpretation services in a virtual setting requires on average 25% more resources, which translates to an incremental cost of about \$300,000 for a typical month. Since interpretation service levels do not depend on the number of members in a sitting, but rather on the length of the sitting, we have allocated this incremental amount between both chambers based on the total number of hours of activities (sittings and committees) in a typical week.<sup>6</sup>

Based on all the above information, the PBO prepared an estimate of incremental costs over a full year of operation of a hybrid Parliament. Table 2-1 provides a breakdown of the incremental costs between fixed and recurring costs for each chamber. We can see that interpretation is the most

important cost of operating in a hybrid system, as it represents more than 75% of recurring costs.

**Table 2-1 Incremental costs of operation for hybrid parliamentary proceedings**

	(thousands of \$)		
	Senate	House of Commons	Both Chambers
<b>Initial set-up costs (non-recurring)</b>			
Acquisition of equipment and development of virtual voting solution	400	1,498	1,898
<b>Total non-recurring costs</b>	<b>400</b>	<b>1,498</b>	<b>1,898</b>
<b>Recurring costs (on an annual basis)</b>			
Incremental salaries	142	777	919
Internet costs for Members employees	17	113	130
Interpretation services (Translation Bureau)	1,285	2,315	3,600
<b>Total recurring costs</b>	<b>1,444</b>	<b>3,204</b>	<b>4,649</b>

Note: The Senate did not provide an estimate of the incremental costs associated with incremental salaries and internet costs for employees of Senators. The amount for incremental salaries in the Senate is extrapolated based on the ratio of all wages in the Senate to all wages in the House of Commons. The amount for internet costs is extrapolated based on the ratio of the number of seats in the Senate to the number of seats in the House of Commons and then divided by two since Senators usually have less employees than MPs.

Sources: Senate administration, HOC administration, Translation Bureau and PBO's calculations

## 2.2 Savings

As some parliamentarians will participate remotely, we can assume travel expenses will reduce significantly for those no longer traveling from their constituencies to Ottawa and back. This following section explains how we measured the savings from reduced travel. Note that savings from travel also includes associated accommodation, meals and incidental costs.<sup>7</sup>

We tried to separate the reduction in travel due to a hybrid setting from the reduction strictly attributable to the pandemic. For example, outside of the pandemic parliamentarians might have traveled within Canada to attend events, but because of the pandemic these events are no longer taking place in person. Such a reduction in travel is not considered as a cost saving from functioning under a hybrid parliamentary system.

On a much smaller scale, food services also generate some savings in a hybrid context. The details are explained in the section 2.2.2 below.

2.2.1 Savings from reduced travel

Through ParlVU, several HOC sittings were used to identify members participating in person. We determined that the number of MPs physically present at each sitting was relatively similar. While the individual MPs present in the House can change from one sitting to another (we assume parties have rotation lists to allocate spots for MPs that wish to be participating in person), the number of MPs by province/territory remains stable throughout the sittings. Thus, we have assumed that there would be on average 80 members in person at each sitting with a provincial breakdown as presented in Table 2-2.<sup>8</sup>

We used the same method for the Senate through SenVU. In the case of the Senate, the participation rate is slightly higher, since we arrive at an assumption that 43% of senators participate in person (45/105). Unlike MPs, senators participating in person are usually the same from one sitting to another. Table 2-2 also presents the provincial breakdown for Senators participating in person.<sup>9</sup> Note that since the territories each have one seat in the Senate with these senators participating in person for some sittings, we have assumed 0.5 member in person for the calculations.

**Table 2-2 Provincial/territorial breakdown of Senators and MPs participating in person**

Province/Territory	Senate		House of Commons	
	Number in person	Number of seats	Number in person	Number of seats
Newfoundland and Labrador	2	6	0	7
Nova Scotia	0	10	1	11
Prince Edward Island	0	4	0	4
New Brunswick	2	10	1	10
Quebec	14	24	22	78
Ontario	15	24	30	121
Manitoba	4	6	4	14
Saskatchewan	3	6	4	14
Alberta	2	6	9	34
British Columbia	2	6	11	42
Yukon	0.5	1	0	1
Northwest Territories	0.5	1	0	1
Nunavut	0.5	1	0	1
<b>TOTAL</b>	<b>45.5</b>	<b>105</b>	<b>80</b>	<b>338</b>

Source: PBO's calculations

Using data from the Members' Expenditure Report (the annual reports for years 2016-17 to 2018-19)<sup>10</sup>, we calculated the average of annual spending

on regular travel per member for each province/territory. Regular travel corresponds mostly to travel between the member’s principal residence (or constituency) and Ottawa, and vice-versa.<sup>11</sup>

The Senate also discloses publicly all travel expenditures incurred by senators. Using the travel expenditures reports for years 2017-18 and 2018-19<sup>12</sup>, we calculated the average annual spending per Senator for each province/territory.<sup>13</sup> Table 2-3 presents the average regular travel expenditure by province for Senators and MPs separately.<sup>14</sup>

**Table 2-3 Average annual regular travel expenditure per Senator and MP**

<b>Province/Territory</b>	<b>Average expenditure per Senator (\$)</b>	<b>Average expenditure per MP (\$)</b>
Newfoundland and Labrador	54,072	61,365
Nova Scotia	32,956	40,705
Prince Edward Island	34,108	43,631
New Brunswick	23,372	42,376
Quebec	24,558	16,808
Ontario	20,570	27,767
Manitoba	35,778	58,396
Saskatchewan	52,552	52,877
Alberta	52,922	56,697
British Columbia	59,690	65,045
Yukon	64,268	76,259
Northwest Territories	60,683	57,016
Nunavut	103,248	75,594

Sources: Senate Travel Reports, Members Expenditures Reports and PBO’s calculations

We then multiplied the respective average provincial regular travel expenditure by the difference between the number of seats in the province/territory and the number of Senators or MPs attending proceedings of their chamber in person. The sum across all provinces and territories gives us the total savings in travel from a full year of hybrid parliamentary proceedings. The savings related to travel represent more than 90% of the savings from having a hybrid parliament.

2.2.2 Savings from food services

Most of the food sold in the cafeterias within the parliamentary precinct is sold at cost, not considering the salaries of the food services staff. Therefore, if fewer members are present in Ottawa, there is a decrease in the usage of food services which means less staff is needed. This decrease in staff induces

some savings on salaries while there is no offsetting loss of profit given the almost nil margin of profit.

Based on information provided by the Senate and HOC administrations, as well as the Financial Statements from both organizations, the PBO estimated the annual savings to be \$177,000 and \$772,000, respectively.

### 2.3 Green house gas (GHG) emissions

Based on data from the Intergovernmental Panel on Climate Change (IPCC) and the International Civil Aviation Organization (ICAO), we assume each kilometer of travel by plane emits 114 grams of CO<sub>2</sub> equivalent per passenger.<sup>15</sup> As for travel by road vehicle, we assumed each kilometer travelled emits 269 grams of CO<sub>2</sub> equivalent, based on data from the U.S. Environmental Protection Agency (EPA).<sup>16</sup>

We multiplied these values by the distance travelled in each regular trip by members. Since the members' detailed travel expenditures report does not specify the type of transportation used, we assumed that trips of 500 km or less were travelled by road, while trips above that distance were travelled by plane. We are thus likely overestimating the emissions for trips of 500 km or less that were travelled by plane rather than road.

Note that for road transportation, we assume the vehicle was occupied by one person only. However, since family or employees sometime join the member on the trip to Parliament, the emissions could be overestimated as we are also counting emissions for trips claimed for family and employees. We are also possibly overestimating emissions for plane travel, since in commercial flights the plane will likely take off whether the member is on it or not.<sup>17</sup>

As for the savings from travel, we calculated the average GHG emissions per Senator and MP in each province/territory, and multiplied it by the difference between the number of seats in the province/territory and the number of Senators or MPs attending proceedings of their chamber in person. The sum across all provinces and territories gives us the total reduction in GHG from a full year of hybrid parliamentary proceedings.

### 2.4 Caveats

The Members' Detailed Travel Expenditures Report only provides the total cost of travel for a given claim. Therefore, if the member has submitted more than one trip in the same claim, there is no breakdown of the costs between each trip. We used the distance between each departure and destination point to allocate the cost of the claim to each trip as its share of the total distance traveled for that claim. This will only have an impact on our results when a regular travel and a special travel are submitted in the same claim. Since more than 80% of travel by members is regular travel, and many

submit a separate claim for each trip, we do not believe it has a significant impact on our results.

As mentioned above, we saw some MPs participating in person for one House of Commons sitting, and then participating remotely in another sitting. Therefore, we might be overestimating the savings from reduced travel. Suppose for example, that before the pandemic two MPs from a province would both travel to Ottawa at the beginning of the week, and then go back to their home province during the weekend. If under the hybrid system they now participate in person for half of the week each, they might still both travel to Ottawa and thus no savings would be achieved, except possibly for accommodations if they stay fewer days and do not maintain a secondary residence in Ottawa. Furthermore, some members that we counted as participating remotely could have been doing so from their office on Parliament Hill. Thus, while they are not in person in the House, they are still traveling to Ottawa.

Another possibility is that more MPs would still want to participate in person in the proceedings of the House of Commons, if it was not for the current restrictions in terms of the number of members allowed on site because of the pandemic. For all these reasons, we also present the results (in section 3 of this report) for an alternate scenario where one out of two members in both the Senate and the House would still participate in person. We also present the percentage of parliamentarians participating remotely required to break-even where the costs and savings of a hybrid parliamentary system would offset each other.

Lastly, it is possible that outside of a pandemic, some members might choose to participate in sittings remotely and take advantage of this opportunity to incur more travel within their riding to meet with their constituents and participate in more events. This could increase the costs of travel and offset some of the savings from the hybrid parliamentary system.

## 3. Results

Table 3-1 presents the costs and savings of a hybrid parliamentary system, when using the assumption that attendance is similar to that observed during the pandemic since the beginning of the 2<sup>nd</sup> session of the 43<sup>rd</sup> Parliament on September 23, 2020. As can be seen, over a full year the net savings from a hybrid parliamentary system are estimated at \$6.2 million (including the non-recurring costs). Looking at the monthly net savings excluding the non-recurring costs, they are estimated at \$673,000 and therefore, it would take about 2.8 months to recoup the initial setup costs (the non-recurring costs). It is also estimated that the hybrid parliamentary system would reduce GHG emissions related to travel by about 2,972 metric tons of CO<sub>2</sub> equivalent.

**Table 3-1 Net savings from a hybrid parliamentary system**

	(thousands of \$)		
	Senate	House of Commons	Total
Recurring costs	(1,444)	(3,204)	<b>(4,649)</b>
Savings	2,231	10,497	<b>12,728</b>
<b>Net savings (annual - excluding set-up costs)</b>	787	7,293	<b>8,079</b>
Minus: Set-up costs	(400)	(1,498)	<b>(1,898)</b>
<b>Net savings (annual)</b>	387	5,795	<b>6,181</b>
<b>Net savings (monthly - excluding set-up costs)</b>	66	608	<b>673</b>
Number of months necessary to recoup set-up costs	6.1	2.5	<b>2.8</b>
<b>Annual reduction in GHG (metric tons of CO<sub>2</sub> equivalent)</b>	484	2,488	<b>2,972</b>

Source: PBO's calculations

Since the Senate has slightly less than a third of the seats of the House of Commons (105 vs 338), it is not surprising that the net savings are larger in the House. Furthermore, a higher share of Senators are currently participating in person. Table 3-2 presents the results under an alternative assumption where half of the members in each chamber would be participating in person.

**Table 3-2 Net savings from a hybrid parliamentary system (half of Senators and MPs participating in person)**

	(thousands of \$)		
	Senate	House of Commons	Total
Recurring costs	(1,444)	(3,204)	<b>(4,649)</b>
Savings	1,918	7,058	<b>8,975</b>
<b>Net savings (annual - excluding set-up costs)</b>	473	3,853	<b>4,327</b>
Minus: Set-up costs	(400)	(1,498)	<b>(1,898)</b>
<b>Net savings (annual)</b>	73	2,355	<b>2,429</b>
<b>Net savings (monthly - excluding set-up costs)</b>	39	321	<b>361</b>
Number of months necessary to recoup set-up costs	10.1	4.7	<b>5.3</b>
<b>Annual reduction in GHG (metric tons of CO<sub>2</sub> equivalent)</b>	421	1,618	<b>2,039</b>

Source: PBO's calculations

We can see from table 3-2 that the net savings over a year would be somewhat smaller if more members are travelling, at \$2,4 million. The reduction in GHG emissions would also be smaller, at 2,039 metric tons of CO<sub>2</sub> equivalent. Less savings obviously mean it will take more time to recoup the initial costs, which is now estimated at 5.3 months. It is possible that with less members participating remotely, the initial costs would be lower as fewer portable computers and headsets are purchased. However, most members are already equipped with mobile devices (MS Surface and other tablets) and thus the difference would likely be negligible.

Finally, Table 3-3 presents the percentage of members participating remotely needed to completely offset (i.e. break-even) the cost of implementing or maintaining a hybrid parliamentary system based on different amortization periods of the set-up costs. For example, if all the equipment needed to allow parliamentarians to participate remotely had to be replaced every three years, the Senate would break-even if 45% of Senators participated remotely in all sittings (or if all Senators reduced their travel to Ottawa by 45%). That number is 29% for the House of Commons.<sup>18</sup> The table also shows that if we ignore the set-up costs, having MPs renounce to 1 out of 4 trips they would normally make to Ottawa would already generate enough savings to offset the recurring costs of having a hybrid parliament. Lastly, all these scenarios estimate that GHG emissions would be reduced by more than one thousand metric tons of CO<sub>2</sub> equivalent.

**Table 3-3 Remote participation required to reach the break-even point**

<b>Amortization of set-up costs</b>	<b>Percentage of members participating remotely</b>		<b>Annual reduction in GHG (metric tons of CO2 equivalent)</b>
	<b>Senate</b>	<b>House of Commons</b>	
One year	53%	37%	1,656
Three years	45%	29%	1,335
Five years	44%	28%	1,270
None (recurring costs only)	41%	25%	1,174

Source: PBO's calculations

# Notes

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- <sup>1</sup> These special rules were to be in effect until the House would rise for the winter break, on December 11, 2020. See: <https://www.ourcommons.ca/DocumentViewer/en/43-2/house/sitting-1/journals>. A new motion was adopted upon the return of the House, on January 25, 2021, to continue with hybrid sittings until the House will rise for the summer break on June 23, 2021. See: <https://www.ourcommons.ca/DocumentViewer/en/43-2/house/sitting-49/journals>.
- <sup>2</sup> These special rules were to be in effect until the Senate would rise for the winter break, on December 18, 2020. See: [https://sencanada.ca/en/content/sen/chamber/432/journals/005jr\\_2020-10-27-e](https://sencanada.ca/en/content/sen/chamber/432/journals/005jr_2020-10-27-e). This motion was subsequently extended on December 17, 2020, to be in effect from February 1, 2021 to June 23, 2021. See: [https://sencanada.ca/en/content/sen/chamber/432/journals/023jr\\_2020-12-17-e](https://sencanada.ca/en/content/sen/chamber/432/journals/023jr_2020-12-17-e)
- <sup>3</sup> Electronic equipment used in a business context generally has a useful life of around three to five years. Thus, even though we are classifying some of these costs as non-recurring, they would reoccur over the course of multiple years.
- <sup>4</sup> For a detailed discussion on the additional needs in terms of staff and equipment to operate the HOC in a hybrid setting, see: [VIRTUAL CHAMBER: A Report in Response to the Statement of the Speaker of the House on April 8, 2020](#)
- <sup>5</sup> See for example: <https://www.thestar.com/politics/2021/01/19/parliamentary-hearings-over-zoom-an-ongoing-headache-for-translators.html>
- <sup>6</sup> We looked at the duration of all sittings and committee meetings during the week of March 6, 2019 to March 10, 2019 where both chambers were sitting according to their regular calendar. In total, 80 hours (36%) of proceedings were held in the Senate and 144 hours (64%) in the House of Commons. Thus, we allocated 36% of the costs to the Senate and the remainder to the House of Commons.
- <sup>7</sup> The Senators' Office Management Policy ([https://sencanada.ca/media/366713/ppd\\_somp\\_ext\\_e.pdf](https://sencanada.ca/media/366713/ppd_somp_ext_e.pdf)) specifies that "Senators may request reimbursement from their living expenses budget for their Parliamentary District accommodation expenses in any one of [these] three categories : a) Nightly Accommodation (Commercial or Private); b) Rental Accommodation; c) Privately-Owned Accommodation". The Members' Allowances and Services Manual (<https://www.ourcommons.ca/Content/MAS/mas-e.pdf>) indicates that "Members whose constituency is not located in the National Capital Region (NCR) may choose to stay in a commercial or private accommodation, or at a personal residence when in the NCR." Thus, we have considered the costs of nightly accommodation (for Senators) and accommodation outside a

personal residence (for MPs) in the potential savings from reduced travel. However, we have not considered the costs of having a secondary residence in the NCR (rented or owned) as a potential for savings, as we assumed that Senators and MPs keeping a secondary residence would keep it in a hybrid system.

- <sup>8</sup> It was assumed that the members participating in person in the Senate or the House of Commons sittings would be the same members participating in person to the committees' meetings.
- <sup>9</sup> Note that there are currently 13 vacant seats in the Senate. The numbers presented in Table 2-2 assume a full Senate where members have been appointed to these vacant seats since the savings in travel expenses from vacant seats are not a consequence of the chamber functioning in a hybrid setting.
- <sup>10</sup> The annual report for year 2019-20 was not used as this was an election year during which MPs did not sit in the House between June 24, 2019 and December 5, 2019.
- <sup>11</sup> The Senators' Office Management Policy and the Members' Allowances and Services Manual (see links in endnote 7) both specify that regular trips are: between Ottawa and the Senator's province/territory or the member's constituency; within the Senator's province/territory or the member's constituency; and from Ottawa or the member's constituency to the provincial/territorial capital in which the constituency is located. Special trips, which we have not considered in our calculations of savings from reduced travel, are trips in Canada other than regular trips (events, conferences, training, etc.). Lastly, USA trips (which we have also not considered) are trips to New York City to attend United Nations (UN) events or meet with UN officials, or trips to Washington D.C. to carry out parliamentary functions.
- <sup>12</sup> The year 2019-20 was also not used since the Senate did not convene during the electoral campaign. Unlike for the HOC, we did not use year 2016-17 as data for the Senate was not available for the first quarter of that financial exercise.
- <sup>13</sup> The Senate seats for the Northwest Territories and Yukon were vacant from November 21, 2017 and August 15, 2017 respectively, until two new Senators were appointed on December 12, 2018. The average travel expenditure per senator for these territories were therefore calculated using the only full year of data available (the election year 2019-20) and increasing it by 20%, which is the average reduction in travel expenditures for all senators between 2018-19 and 2019-20.
- <sup>14</sup> The Senate Travel Reports do not indicate which type of points (regular, special or USA) was used for a trip like the House of Commons does. Therefore, to calculate the average regular travel expenditure for Senators, we only considered trips where the purpose field contained one of the following: Senate sitting; Returning to province/territory; Caucus; Committee; Office work; Parliamentary association.
- <sup>15</sup> Data for emissions by kg of plane fuel used are from Table 1 of IPCC's background paper "Aircraft Emissions" (available at: [https://www.ipcc-nggip.iges.or.jp/public/gp/bgp/2\\_5\\_Aircraft.pdf](https://www.ipcc-nggip.iges.or.jp/public/gp/bgp/2_5_Aircraft.pdf)). The emissions are converted to CO<sub>2</sub> equivalent using the Global Warming Potential (GWP 100-year) multipliers from Table 8.A.1 of Myhre, G. et al. 2013: Anthropogenic and Natural Radiative Forcing. In: Climate Change 2013: The Physical Science

Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA (available at: [https://www.ipcc.ch/site/assets/uploads/2018/02/WG1AR5\\_Chapter08\\_FINAL.pdf](https://www.ipcc.ch/site/assets/uploads/2018/02/WG1AR5_Chapter08_FINAL.pdf)). Data on average fuel consumption per km are from Aircraft Commerce, Nimrod Publications, UK. We assumed there were on average 90 passenger per flight, based on passenger data for North America from Table 4 of 2018 Air Transport Statistics published by ICAO (available at: [https://www.icao.int/annual-report-2018/Documents/Annual.Report.2018\\_Air%20Transport%20Statistics.pdf](https://www.icao.int/annual-report-2018/Documents/Annual.Report.2018_Air%20Transport%20Statistics.pdf)).

- <sup>16</sup> The average passenger vehicle emits about 411 grams of CO<sub>2</sub> per mile (which converts to 255 grams per km), based on the report “Greenhouse gas emissions from a typical passenger vehicle” United States Environmental Protection Agency, Office of Transportation and Air Quality. 2014. EPA-420-F-14-040 (available at: <https://nepis.epa.gov/Exe/ZyPDF.cgi/P100JPPH.PDF?Dockey=P100JPPH.PDF>). As suggested in the EPA report, vehicle emissions of other GHG are assumed to represent 5% of total emissions and thus, we multiply the CO<sub>2</sub> estimate by 100/95 to obtain a total of 269 grams of CO<sub>2</sub> equivalent per km.
- <sup>17</sup> We are possibly also underestimating emissions since most flights West from Ottawa Macdonald-Cartier International Airport (YOW) have a layover at Toronto Pearson International Airport (YYZ) and most flights East have a layover at Montréal–Trudeau International Airport (YUL). This incurs more kilometers travelled than our direct flight calculation from origin to destination. Furthermore, the Senators’ Office Management Policy indicates that Senators and their family “may travel business class, except when the point of origin and the point of destination are Ottawa and Montréal or Ottawa and Toronto.” Similarly, the Members’ Allowances and Services Manual indicates that MPs and their family may travel in business class for a trip longer than two hours (which corresponds approximately to a radius from Sudbury, ON to Quebec City, QC). Since the space occupied by a seat in business class is usually twice as one in economy class, some sellers of carbon offsets allow you to choose the class used and will count twice as much GHG emissions when business class is chosen (see for example [planetair.ca](http://planetair.ca)). Our estimate does not factor in the larger space occupied by a business class seat. Lastly, most sellers of carbon offsets also offer an option to offset the total impact of the flight. This is because planes release most of their GHG at high altitude and it is believed that it causes more damage. Thus, when that option is chosen, they double the estimation of GHG emissions as is suggested by some findings from the IPCC. This phenomenon is called radiative forcing and because there does not appear to be a consensus on radiative forcing yet, we have not included this high-altitude impact in our GHG estimate.
- <sup>18</sup> For these calculations, we assume that the set-up costs and the recurring costs and savings (except travel) are independent from the number of parliamentarians participating remotely. More members participating in person could perhaps require more staff in the cafeterias, which would reduce the savings from food services. At the same time, it could also require less resources to support the virtual part of the proceedings which would reduce the recurring costs. Since these elements are relatively small compared to the savings from travel, this assumption should have a negligible impact on the results.