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Fragmentation and Coordination of REDD+ Finance under the Paris Agreement Regime

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Abstract: Under the Kyoto Protocol regime, various forms of financial support have been committed to helping the implementation of reducing emissions from deforestation and forest degradation, as well as fostering conservation, the sustainable management of forests, and the enhancement of forest carbon stocks (REDD+) in developing countries. We analyzed the fragmentation of REDD+ finance and suggested methods for its coordination under the Paris Agreement regime. The fragmentation of REDD+ finance was observed, but it was lower than that of general official development assistance (ODA). However, we found that the trend of fragmentation in REDD+ financing is different from that of general ODA, with a few major donors occupying a large portion of the total size of committed REDD+ finance. Thus, it may not be appropriate to consider the fragmentation of REDD+ finance merely as an obstacle that needs to be decreased. Still, the total amount of REDD+ finance should be increased and adjusted for various donor–recipient relationships, in consideration of the REDD+ finance options in the Paris Agreement. Some REDD+ countries have made progress in national REDD+ and accomplished emission reductions. However, REDD+ finance needs to be stratified considering the progress of national REDD+. For such forms of cooperation, an information-sharing and monitoring system that collects information on ongoing REDD+ cooperation, the commitment and expenditure of REDD+ finance, and the support needs of REDD+ countries at a global level should be established. Multilateral organizations need to provide safeguarding functions for developing countries that are isolated from bilateral REDD+ finance.

Keywords: aid fragmentation; aid harmonization; cooperative approaches; international cooperation

Citation: Kim, D.-h.; Kim, D.-h.; Kim, H.S.; Kim, R. Fragmentation and Coordination of REDD+ Finance under the Paris Agreement Regime. *Forests* **2021**, *12*, 1452. <https://doi.org/10.3390/f12111452>

Received: 22 September 2021

Accepted: 22 October 2021

Published: 25 October 2021

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1. Introduction

The global climate regime has transitioned from the Kyoto Protocol to the Paris Agreement from 2021, and conserving and enhancing sinks and reservoirs of greenhouse gases are undoubtably important. To aid in reducing emissions from deforestation and forest degradation and fostering conservation, the sustainable management of forests, and the enhancement of forest carbon stocks (REDD+), an incentive mechanism for reducing greenhouse gas (GHG) emissions in the forest sector was developed through negotiations and decisions under the Kyoto Protocol regime. Under the Kyoto Protocol regime, developing countries—the non-Annex I countries of the Kyoto Protocol—were encouraged to undertake forest sector mitigation actions and receive result-based finance [1]. Article 5 of the Paris Agreement acknowledges the existing framework of REDD+ and encourages its implementation and support. Thus, under the Paris Agreement, REDD+ will be important for

developing countries to meet their national emissions reduction targets submitted through Nationally Determined Contributions (NDCs). In addition, developing and developed countries are expected to engage in REDD+ cooperation as cooperative approaches to achieve more ambitious reduction targets of REDD+ countries and to transfer internationally transferred mitigation outcomes (ITMOs) to partner countries to use them to meet partner countries' NDCs. To realize such expectations, several conditions must be met [2]; among these, this study focuses on the following two conditions.

The first condition concerns developing elements of the UNFCCC Warsaw Framework on REDD+ (WRF) and relevant decisions. REDD+ countries are required to implement REDD+ at the (sub-)national level by first satisfying four elements of the WRF—consisting of the National Strategy and Action Plan (NSAP), Forest Reference Emission Level(s)/Forest Reference Level(s) (FREL(s)/FRL(s)), National Forest Monitoring System (NFMS), and Summary of Information on Safeguards (SIS)—and measuring, reporting, and verifying (MRV) the reductions in emissions through REDD+ implementation, as agreed in the Conference of Parties in UNFCCC [3,4]. However, presently, the majority of developing countries do not meet the WRF requirements; among the 62 countries listed on the UNFCCC REDD+ web platform, only 11 have registered emission reduction results (ERs) and 7 have received result-based payments (RBPs).

The second condition concerns the effective provision of REDD+ finance to support REDD+ implementation in developing countries. While the national circumstances of developing countries regarding implementing REDD+ vary, support from the international community is indispensable as the preparation and implementation of REDD+ at the national level involves considerable costs and risks [5–7]. Discussion about REDD+ finance for developing countries has been one of the key issues of REDD+ negotiations in UNFCCC COPs [1,8]. The parties have agreed that REDD+ finance should be new, additional, and predictable and may utilize various public, private, bilateral, and multilateral financial resources [9]. Although international financial support for the implementation of REDD+ in developing countries was carried out following the negotiations and decisions of the UNFCCC [10], the governance of the financing system remains vague.

Around the aforementioned agreements and objectives of REDD+, various forms of bilateral and multilateral REDD+ finance, which have their own purposes and criteria, have appeared independently, which has led to an increase in the institutional complexity and fragmentation of the REDD+ financing system [11,12]. The complex and fragmented REDD+ finance system has been meaningful in that it encourages the participation of additional developed countries in REDD+ finance and helps to establish infrastructure and institutional equipment for REDD+ and develop REDD+ pilot projects in the recipient countries [11,13]. However, voluntary and individual characteristics of REDD+ finance have led to inefficiencies, such as the repetition of support with similar purposes and the concentration of REDD+ finance in a few developing countries [14]. Accordingly, there is a need to coordinate the various REDD+ finance systems [6,11,15–17]. Recognizing this issue, the Paris Agreement encouraged the Green Climate Fund (GCF) to adjust REDD+ finance [18].

It is important to investigate the fragmentation and methods of adjustment to increase the efficiency of REDD+ finance and to achieve more effective mitigation through REDD+. However, previous studies have not sufficiently analyzed the fragmentation of REDD+ finance. Among a few relevant previous studies, [12] identified major donors and recipients of REDD+ finance and analyzed the size of REDD+ finance per period; [19] mapped donors and recipients through social network analyses and showed that global REDD+ finance has become more fragmented over time. However, these studies have limitations: [12] did not conduct a direct analysis of the fragmentation of REDD+ finance, and [19] did not consider the size of the committed/received finance, which is one of the most important elements of REDD+ finance, in their analysis.

Therefore, we aim to understand the complexity and fragmentation of REDD+ finance better through a quantitative analysis utilizing the global data on committed REDD+

finance. Based on our analysis, we provide several recommendations for the coordination of fragmented REDD+ finance in order to contribute to more effective mitigation through REDD+ under the Paris Agreement regime. To this end, we propose the following research question: How fragmented is the REDD+ finance conducted under the Kyoto Protocol regime? The remainder of this study proceeds as follows. In Section 2, we discuss the characteristics of REDD+ finance and its fragmentation in detail. In Section 3, the empirical data and methods are described. In Section 4, the results of our analysis are presented. In Section 5, our results are discussed. Section 6 concludes this study.

2. Conceptual Backgrounds

2.1. Transition of the Climate Regime and Characteristics of REDD+ Finance

As subsidiary agreements of UNFCCC, the Kyoto Protocol and Paris Agreement form the foundations of the Kyoto Protocol and Paris Agreement regimes. Although they have a common goal to maintain the global average temperature below 2 °C above the pre-industrial level, differences exist in several aspects; for example, the scope of the parties responsible for GHG mitigation and approaches in which mitigation activities are approved. Accordingly, characteristics of REDD+ finance under the Paris Agreement and Kyoto Protocol regimes have both similarities and differences.

In the Kyoto Protocol regime, only developed countries belonging to Annex I were responsible for mitigation. Though developing countries did not have such a responsibility, REDD+ was proposed and developed in UNFCCC negotiations to encourage developing countries to reduce emissions in the forest sector [20]. This emerged in 2005 as Reducing Emissions from Deforestation (RED) and was quickly expanded to REDD+ through consecutive negotiations; the framework of REDD+ implementation, WRF, was adopted at COP 19. Considering respective capabilities and national circumstances and different levels of support received, developing countries may take a phased approach—Readiness (phase 1), Implementation (phase 2), and RBP (phase 3)—to implement REDD+ (Table 1). With these institutional environments, REDD+ finance serves as an aid to developing countries to support their REDD+ implementation capacity and receive compensation without any returns to the “donor” developed countries or institutions that provided REDD+ finance.

Table 1. REDD+ phased approaches [3].

Implementation Phase	Activities
Phase 1: Readiness	- Formulation of national REDD+ strategy
	- Development of REDD+ policies and measures
	- Capacity building
Phase 2: Implementation	- (Sub)national demonstration activities (subnational level is possible during this interim period)
	- Implementation of REDD+ policies and measures
Phase 3: Result-based payments	- Full implementation at national level
	- Measurement, reporting, and verification (MRV)
	- Receive results-based finance

Under the Paris Agreement, in contrast to the Kyoto Protocol, all 196 parties, which also include developing countries, are responsible for climate action: to this end, parties are required to set, regularly update, and strive to achieve the NDCs, which are the national mitigation and adaptation objectives of each party [21]. Article 6 of the Paris Agreement allows parties to transfer ITMOs between themselves through cooperative approaches and utilize ITMOs to achieve NDCs, while the relevant specific guidelines are not agreed yet; Article 5 of the Paris Agreement acknowledges the existing REDD+ frameworks and encourages parties to take actions to support and implement REDD+ [22]. Accordingly, it is highly likely that REDD+ will be used as a means not only to achieve a host country's NDC but also to secure and use ITMOs for the partner countries' NDCs (Table 2).

Table 2. Climate regimes and REDD+ financing [1,21,22].

Characteristics		Kyoto Protocol		Paris Agreement
Period	-	First: 2008–2012	-	Post-2020
	-	Second: 2013–2020		
Emissions Reduction Obligations	-	Developed countries (Annex I countries)	-	All countries that ratified the agreement
REDD+ financing	-	The provision of adequate and predictable support to developing country parties to develop elements of the Warsaw Framework for REDD+	-	Encouraged to take action to implement and support REDD+ (Article 5)
	-	Results-based finance provided to developing country Parties for the full implementation of the REDD+ activities	-	Voluntary cooperation in the implementation of their NDCs, and engaging in cooperative approaches that involve the use of internationally transferred mitigation outcomes (Article 6)

2.2. Donors' Motivations for REDD+ Finance

Considering that REDD+ finance has similarities with aid, studies on donors' motivation for aid allocation can provide insights on the motivations of donors in REDD+ finance. These studies suggest that recipient needs for aid [23,24] and recipient merits that may impact effectiveness and efficiency of aid [25–27] are some of the determinants of aid allocation; donor interest was also found to be an important determinant, as aid is a part of the donors' foreign policy, through which donors seek political and economic benefits [26,28–30]. It was also found that, under the Kyoto Protocol regime, donors of REDD+ finance have considered recipient needs, recipient merits, and donor interests when allocating finance to REDD+ countries [31].

2.3. Fragmentation of REDD+ Finance

Aid fragmentation, which refers to “aid to a recipient country received from too many sources and spread over too many programs” [32], becomes severe as the number of donor countries and organizations and recipient countries increases. Aid fragmentation has been reported to negatively impact the effectiveness of aid by causing problems such as an increase in transaction costs, a decrease in the amount of aid allocated to individual recipient countries, and an increase in the administrative demands in recipient countries [33,34]. Under the Kyoto Protocol regime, the size of REDD+ finance and the number of donor countries, organizations, and recipient developing countries have increased rapidly in line with the institutionalization of REDD+ [19], which has deepened the fragmentation of REDD+ finance. It is expected that the fragmentation of REDD+ finance will become serious under the Paris Agreement regime, as all parties are obliged to make efforts for mitigation; actions for REDD+ implementation are also encouraged. More actors, including both donor and recipient countries and even some organizations, will attempt to use REDD+ to meet their obligations. For example, 56 countries mentioned in their NDCs explicitly that they were considering REDD+ as a means to achieve their national emissions reduction targets [35].

Considering the financing motivation of donors and relevant decisions of UNFCCC, REDD+ financing under the Paris Agreement regime will serve an important role in supporting developing countries to establish elements of WRF, delivering the RBP to developing countries for their REDD+ activities, as well as implementing cooperative approaches and securing ITMOs.

3. Methodology

3.1. Data Collection

We collected data on bilateral and multilateral REDD+ finance commitments from 2005 to 2019 to analyze the distribution and fragmentation of REDD+ finance. Among the REDD+ finance cases reported in the Food and Agricultural Organizations Voluntary REDD+ Database (FAO VRD) [36] and Overseas Development Institute Climate Funds Update (ODI CFU) [37], 25 donors (16 countries and nine organizations) and 108 recipient countries were selected for analysis. For the analysis, 2110 cases from FAO VRD and 384 cases from ODI CFU were analyzed.

3.2. Methods

3.2.1. Fragmentation of REDD+ Finance

We applied the fragmentation and concentration rate estimation method presented in [32], which considers both the perspectives of donors and recipient countries, to analyze the degree of fragmentation of REDD+ finance. Assuming that there is a donor–recipient relationship in which the recipient country receives a much smaller amount of REDD+ finance compared to the corresponding donor’s other recipients, the importance of this relationship for the donor may not be significant. However, if this donor is a major or the only donor for the recipient country, the importance of this relationship for the recipient country will be significant. In this context, if the significance of committed REDD+ finance is low for both a donor and a recipient tied in a donor–recipient relationship, such finance is considered not to be significant.

Based on this proposition, we conducted two analyses on the donor–recipient tie. First, we analyzed whether a donor supported a specific recipient country in a higher proportion than the ratio of its total amount of REDD+ finance to the total global amount of REDD+ finance. Assuming donor A provides REDD+ finance to recipient B, recipient B is considered significant from donor A’s perspective if

$$\frac{\text{Size of finance from donor A to recipient B}}{\text{Total size of donor's REDD + finance}} \geq \frac{\text{Total size of donor's REDD + finance}}{\text{Total size of global REDD + finance}} \quad (1)$$

Otherwise, the recipient is not significant.

Second, from the perspective of the recipient country, we ranked all the donors that provided REDD+ finance to this recipient by the respective size of REDD+ finance and analyzed whether a specific donor belonged to the top 90%. Let $D = \{1, 2, \dots, n\}$ be a set of n donors who provide REDD+ finance to a specific recipient country and $F = \{f_1, f_2, \dots, f_n\}$ be a set of the amount of REDD+ finance commitments of each donor in n ; then, donor j in n is significant from the perspective of this specific recipient country if

$$\frac{f_j}{\sum_{i=1}^n f_i} \times 100 \leq 10 \quad (2)$$

where $\sum_{i=1}^n f_i$ refers to the sum of committed REDD+ finance of all n donors to this specific recipient country, and f_j is the amount of REDD+ finance commitment of the j th donor and an element of F .

For the significant/not significant relationships, respectively, from the perspective of a donor and a recipient, four categories of donor–recipient relationships in the global REDD+ finance system can be identified: donor–recipient relationships that are significant both for donors and recipient countries (group A); donor–recipient relationships significant only for donors (group B); donor–recipient relationships significant only for recipients (group C); donor–recipient relationships that are not significant for either donors or recipients (group D).

Based on this categorization, we calculated the ratio of fragmentation at the actor level and the global level, respectively, from the donors’ and recipients’ sides. Following [32], it can be assumed that fragmentation is higher if the share of insignificant relationships to

total relationships is higher. Therefore, the “fragmentation rate” of a country is calculated as $(D/(A + B + C + D))$; the fragmentation rate of the global REDD+ finance system is calculated as the mean of the fragmentation rate of all countries. The potential to improve the efficiency in REDD+ finance is high for the donors and recipients that have a higher fragmentation rate than that of the global REDD+ finance system.

Besides, from the definition of aid fragmentation, it can be assumed that, other conditions being equal, the degree of fragmentation has (1) a positive correlation with the total number of donors and (2) a negative correlation with the total size of commitments. Thus, we investigated whether such relationships were observed in the case of global REDD+ finance by investigating the fragmentation of each recipient REDD+ country.

3.2.2. Classification of REDD+ Countries by REDD+ Progress

To suggest options for the adjustment of fragmented REDD+ finance under the Paris Agreement regime, we grouped REDD+ countries by their REDD+ implementation progress, referring to the information submitted to the UNFCCC REDD+ Web platform. If a REDD+ country has more than one registered case of ERs on the platform and/or received RBP results, it is considered to have fulfilled the WRF elements, as well as to be in phase 3 and classified as group I; if a REDD+ country listed on the website does not have registered ER but has submitted FREL/FRL and received technical assessments, it is considered to be in phase 2 and classified as Group II; if a REDD+ country has registered a national focal point or is listed on the platform (without any further information), it is considered to be in phase 1 and classified in Group III; if a country has not submitted any documents relevant to WRF on the platform, it is considered to be not engaged in WRF and classified as group IV. For each group, the number of recipient countries and donors, allocated amounts of REDD+ finance, and fragmentation rate were analyzed to suggest the coordinating options under the Paris Agreement regime.

4. Results

4.1. Overview of REDD+ Finance

Table 3 shows the 457 bilateral and multilateral REDD+ finance cases between 16 donor countries, 9 donor organizations, and 108 recipient countries that were reported to the FAO VRD and ODI CFU between 2006 and 2014. The total amount of commitment was 9699.27 million USD; of which 63.9% (6197.68 million USD) was bilateral and 36.10% (3501.59 million USD) was multilateral, showing that the amount of bilateral commitment is larger than that of multilateral commitment.

Table 3. Overview of bilateral and multilateral REDD+ finance cases.

Characteristics	Bilateral	Multilateral	Sum
Number of donors	16	9	25
Number of recipient countries	88	91	108
Number of donor–recipient relationships (cases)	264	193	457
Amount of commitment (million USD)	6197.68	3501.59	9699.27
Share of total commitment amount (%)	63.90	36.10	100.00

4.2. Fragmentation of REDD+ Finance

4.2.1. Fragmentation in Recipient Countries Grouped by Major Forest Type

Table 4 shows the fragmentation rate by country groups with major forest types and global REDD+ finance. The number of recipient countries by major forest type was the largest in the tropical country group (87), followed by the sub-tropical group (13), and the temperate and boreal group (8). The number of donor–recipient relationships by continent was the largest in the tropical groups (412), followed by sub-tropical (29), and

temperate and boreal (16). The received amount was the largest in the tropical country group (8881.21 million USD), followed by the sub-tropical group (90.25 million USD), and the temperate and boreal group (390.25 million USD). The fragmentation rate was the highest in the tropical group (22.57%), followed by the sub-tropical group (17.24%), and the temperate and boreal group (12.50%).

Table 4. Fragmentation of REDD+ finance.

Major Forest Type	Recipient Countries (<i>n</i>)	Relationships (<i>n</i>)	Significant Relationships (<i>n</i>)	Insignificant Relationships (<i>n</i>)	Fragmentation Rate (%)	Committed Amount (M USD)
Tropical	87	412	319	93	22.57	8881.21
Sub-tropical	13	29	24	5	17.24	727.80
Temperate and Boreal	8	16	14	2	12.50	90.25
Global	108	457	357	100	21.88	9699.27

4.2.2. Fragmentation among Recipients Reflecting Number of Donors and Size of Received REDD+ Finance

Figure 1 shows the distribution of recipient REDD+ countries in which the *x*-axis is the number of donors and the *y*-axis is the fragmentation rate. Figure 2 displays the relationship between the fragmentation rate (*y*-axis) and the natural logarithm of the committed amount of finance (*x*-axis) among the recipient REDD+ countries. The statistics regarding the amounts of commitments, the number of donors, and fragmentation rate of each recipient country is summarized in Table 5. In both figures, it is assumed that the recipient countries whose fragmentation rate is higher than that of the total global REDD+ finance (21.88%) have a high degree of fragmentation.

Figure 1. Relationship between the number of donors and fragmentation rate in recipient REDD+ countries.

Figure 2. Relationship between the committed amount of finance and fragmentation rate in recipient REDD+ countries.

Table 5. Number of donors, allocated amounts, and fragmentation rate of each quadrant of Figure 1.

Quadrant	Number of Recipients	Number of Donors		Allocated Amount (Million USD)		ln (Amounts)		Fragmentation (%)	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD
I	2	13.00	0.00	316.33	54.99	5.75	0.17	30.77	10.88
II	32	6.59	2.71	206.50	395.91	4.58	1.12	38.62	15.85
III	73	2.82	2.06	20.55	28.81	2.07	1.54	2.55	6.20
IV	1	14.00	-	958.37	-	6.87	-	7.14	-

From the concept of aid fragmentation in which too many donors are providing small amounts of aid, it can be indicated that, other conditions being equal, the relationship between the number of donors and the fragmentation rate is positive, and the relationship between the size of commitments and the fragmentation rate is negative. However, such relationships are not observed in the case of global REDD+ finance; no positive relationship between the number of donors and fragmentation rate is observed (Figure 1), and the correlation between the size of commitments and fragmentation rate is positive (Figure 2). These may indicate that the fragmentation of REDD+ finance has different characteristics from those of the typical aid fragmentation.

4.2.3. Fragmentation of Bilateral and Multilateral REDD+ Finance

Table 6 shows the fragmentation of bilateral and multilateral REDD+ finance from the perspective of donors. In total, 16 donor countries participated in bilateral REDD+ finance; on average, the number of recipient countries they supported was 17, the average amount of commitment was 387.36 million USD, and the fragmentation rate was 28.41%. Nine multilateral organizations participated in multilateral REDD+ finance; on average, 21 recipient countries were supported, the average amount of commitment was 389.07 million USD, and the fragmentation rate was 12.95%. Bilateral financing showed a higher fragmentation ratio than that of multilateral financing.

Table 6. Fragmentation of bilateral and multilateral REDD+ finance.

Type of REDD+ Finance	Number of Donors	Number of Recipients		Amounts		Fragmentation (%)	
		Mean	SD	Mean	SD	Mean	SD
Bilateral	16	17	14.50	387.36	626.00	28.41	15.61
Multilateral	9	21	26.60	389.07	474.24	12.95	10.42

4.3. Classification of REDD+ Countries by REDD+ Progress

Of the 108 recipient REDD+ countries, 11 countries registered ERs and/or received RBPs (Group I). Thirty-six countries submitted FREL/FRLs and completed assessments (Group II). Fifteen countries registered their national focal points or were listed on the UNFCCC REDD+ website (Group III), and 46 countries did not submit (Group IV). The average number of donors and amount of allocated finance were highest in Group I and were second-highest in Group II. Group I and II showed a relatively high rate of fragmentation, at 21.71% and 24.74%, respectively. This may suggest that countries in Groups I and II have high emission reduction potential and a high level of national concerns on deforestation, so they attracted a large amount of finance from many donors, which made the financial aid in these groups relatively more fragmented. In Groups III and IV, the average number of donors, amount of allocated finance, and fragmentation rate were all lower than those in Groups I and II; this may suggest that countries in Group III and IV were relatively alienated from the REDD+ finance due to their lower competitiveness in emission reductions (See Table 7 and Figure 3).

Table 7. Groups of recipient countries by REDD+ progress.

Group	Number of Countries	Number of Donors		Allocated Amounts		Fragmentation (%)	
		Mean	SD	Mean	SD	Mean	SD
Group I	11	7.18	3.37	345.95	668.37	21.71	20.85
Group II	36	6.11	3.16	118.44	145.99	24.74	22.16
Group III	15	3.33	1.88	25.58	25.49	11.84	14.64
Group IV	46	2.35	2.09	27.09	88.00	4.00	11.76

Figure 3. Number of donors and allocated amounts by recipient groups.

5. Discussion

5.1. The Fragmentation of REDD+ Finance

The fragmentation rate was the highest in the tropical country group (22.57%), followed by the sub-tropical country group (17.24%), and the temperate and boreal group (12.50%) (Table 4). A reason for this result could be that the deforestation rate is highest in tropical countries. As most tropical countries that have rainforests in these regions are developing countries in forest transition wherein deforestation occurs, the potential for emission reduction through REDD+ is very high; consequently, the larger the tropical forests, the higher the number of donors may be, leading to an increase in fragmentation rate.

The fragmentation of global REDD+ finance (21.88%) is lower compared to ODA aid fragmentation (40%), as reported by [32]. Considering that aid fragmentation of ODA occurs due to the small amount of finance that is delivered by many donors, this result can be attributed to the fact that the number of participants and the amounts of commitment in REDD+ finance are smaller than those of ODA. Besides, the existence of many recipient countries that received REDD+ finance from only a few donors may also have caused fragmentation to be underestimated. Twenty-seven recipient countries—one-fourth of the total—had only one donor–recipient relationship; although these recipient countries may not be significant from the perspective of the donors, the donors are significant for the recipient countries as they are the only channel for the REDD+ finance.

Among recipient countries, there was no clear relationship between the fragmentation rate and number of donors (Figure 1), and the relationship between the fragmentation rate and size of committed finance was positive (Figure 2). These are different from the explanations of aid fragmentation in which a higher number of donors and smaller size of commitments lead to more fragmentation. This difference may be explained by the existence of a few major donors who occupy a large portion of the total size of committed REDD+ finance. For example, Norway covers 22% of the total size of REDD+ commitments by itself; it also has committed more than 90% of funds to Guyana, making the other four donors' support relatively more fragmented.

The fragmentation of bilateral REDD+ finance (28.41%) is higher than that of multilateral REDD+ finance (12.95%) (Table 6). Donor countries with bilateral relationships tend to consider not only the needs of the recipient countries but also their own potential profit when selecting recipient countries [31]; thus, finance may be herded into a few favorable recipient countries that facilitate meeting the desired profits of developed countries, thereby increasing the fragmentation of REDD+ finance support. Although multilateral organizations support a greater number of recipient countries compared to bilateral REDD+ finance, the fragmentation of multilateral REDD+ finance seems to be lower as multilateral organizations support recipient countries with little or no support from developed countries.

It was observed that the majority of total REDD+ finance comes from a few “major” donors. For example, Norway and Japan were two of the major donors, and Norway has provided a large amount of finance to some recipient countries such as Indonesia and Brazil. This “inequality” among donors in terms of the provision of REDD+ finance makes the donor–recipient relationship with less finance involved appear relatively more fragmented, different from aid fragmentation in ODA, which occurs because small amounts of finance come from too many donors. In this regard, fragmentation in REDD+ finance does not necessarily have the same meaning as that of aid fragmentation defined by [32]. Considering that the amount of REDD+ finance has been insufficient to meet demands and that majority of recipient countries have had limited accessibility to REDD+ finance, the fragmentation of REDD+ finance may be understood as diversification of access to REDD+ finance for recipient countries. Thus, it may not be appropriate to consider fragmentation in REDD+ finance merely as an object that needs to be decreased.

Still, the total amount of REDD+ finance must be increased and adjusted for various donor–recipient relationships, in consideration of the REDD+ finance options in the Paris Agreement. To this end, an information-sharing system that enables transparent

management of the financial commitments and the track of REDD+ countries' demands needs to be established first. The REDD+ partnership, in which 74 countries participated and interacted to share knowledge and experiences, and established VRD that collected information on REDD+ cooperation cases, including donor–recipient relationships, is one such effort. However, as the REDD+ partnership expired as of 2014, the existing VRD should now be updated. Also, while [1] states that the REDD+ implementation results for each relevant period must be reported, as well as the assessed FRLs/FREL, the SIS summary, a link to NSAP, and information on the NFMS, this reporting list does not include the information on REDD+ cooperation between countries, although it is important for the coordination of REDD+ finance. Therefore, such information needs to be collected and managed in the suggested information-sharing system.

Based on such a system, adjustments are required to achieve maximum effectiveness with a limited amount of REDD+ financial resources by ensuring that the small yet valuable financial support from smaller donors is not diluted by those of larger donors. Examples of such adjustments include pairing the REDD+ finance of smaller donors with those of larger donors, or functional differentiation such that larger donors support long-term and large-scale REDD+ programs, while smaller donors support short-term and small-scale REDD+ activities.

5.2. Adjustments under the Paris Climate Regime

Although we analyzed REDD+ finance committed under the Kyoto Protocol regime, since the Paris Agreement regime has started as of 2021, ways of adjusting fragmented REDD+ finance should consider aspects of the Paris Agreement such as NDC, cooperative approaches, and ITMOs.

Of the 108 countries that reported receiving REDD+ finance, only 12 countries have registered REDD+ results on the UNFCCC REDD+ web platform, which suggests that many countries are still in the REDD+ readiness phase or in an early phase of implementation, thus requiring additional supports to develop WRF. The focused allocation of REDD+ finance in countries in Groups I and II might have resulted in a high fragmentation rate in these groups. Considering the lack of REDD+ finance compared to overall demands and higher levels of REDD+ accomplishment of the REDD+ countries that received larger amounts of finance, the fragmentation rate can be interpreted as not only an indicator of the necessity of coordination but also an indicator of the accessibility of REDD+ finance to REDD+ countries. In other words, countries with a lower fragmentation rate have less accessibility to REDD+ finance, as shown in the analysis of Group III (those in their initial stage of national REDD+) and Group IV (those that did not fulfill WRF requirements). Considering the importance of emission reductions in the forest sector to meet climate targets, guaranteeing sufficient opportunities to participate in such efforts for countries in Groups III and IV through sufficient support of REDD+ finance should not be neglected.

Under the Paris Agreement regime, bilateral REDD+ cooperation through cooperative approaches to Article 6 is likely to be made not only to support WRF progress and provide RBPs but also to generate and transfer ITMOs. The REDD+ progress of recipient countries and objectives and motivations of donors and recipients need to be considered when adjusting the fragmented bilateral REDD+ finance. It would be desirable for REDD+ countries in phase I or II, which are developing WRF elements but have not registered any results yet, to receive support from developed countries or multilateral organizations that are willing to provide technical and financial supports to their recipients without any direct benefits (i.e., mitigation outcomes). REDD+ countries in phase III that have developed WRF elements and registered REDD+ results will attempt to receive RBPs and may seek additional support to enhance their existing REDD+ MRV system, as well as cooperative approaches with developed countries to scale up their national REDD+ activities. Thus, it would be desirable for developed countries that aim to encourage REDD+ countries to set more ambitious reduction targets and/or provide technical support to catalyze the improvement of existing MRV systems or to secure ITMOs from REDD+ countries

to provide REDD+ finance to those in phase III. REDD+ countries grouped by REDD+ progress and possible REDD+ finance options are presented in Table 8.

Moreover, as multilateral organizations carry out REDD+ finance in accordance with their own objectives and criteria, they may conduct relatively less fragmented REDD+ finance compared to that of bilateral relationships under the Paris Agreement regime. To achieve climate justice and objectives, it is important for multilateral REDD+ finance under the Paris Agreement regime to play a safeguarding role for REDD+ countries that are relatively alienated from bilateral support.

Table 8. Classification of countries by REDD+ progress and possible financing options.

Classification	Phase I	Phase II	Phase III
Developing WRF elements	Benin, Central African Republic, Chad, Cuba, El Salvador, Equatorial Guinea, Gabon, Malawi, Mali, Namibia, Saint Lucia, Thailand, Togo, Uruguay, Vanuatu	Bangladesh, Belize, Bhutan, Burkina Faso, Cambodia, Congo, Cote d'Ivoire, Democratic Republic of Congo, Dominican Republic, Ethiopia, Ghana, Guinea Bissau, Guyana, Honduras, India, Kenya, Lao People's Democratic Republic, Liberia, Madagascar, Mexico, Mongolia, Mozambique, Myanmar, Nepal, Nicaragua, Nigeria, Pakistan, Panama, Peru, Solomon Islands, Sri Lanka, Sudan, Suriname, United Republic of Tanzania, Vietnam, Zambia	
Provision of result-based payments			Argentina, Brazil, Chile, Colombia, Costa Rica, Ecuador, Indonesia, Malaysia, Papua New Guinea, Paraguay, Uganda
Engaging in Cooperative approaches			

5.3. Contributions and Limitations

This study contributes to the existing literature and the field at large by providing a detailed analysis of the fragmentation of REDD+ finance and specific recommendations to increase the effectiveness of REDD+ finance, which is crucial for REDD+ implementation in developing countries and consequently critical for achieving the goals of the Paris Agreement regime. However, there are limitations in this study owing to conducting analyses based on the data of REDD+ finances carried out under the Kyoto Protocol regime, due to the insufficient number of REDD+ finance investments conducted under the Paris Agreement regime. Further studies that track and monitor REDD+ cooperation cases under the Paris Agreement regime, especially those based on cooperative approaches, are required to contribute to the effective achievement of NDC and climate goals through REDD+. While we investigated the fragmentation of REDD+ finances only from the perspective of aid allocation, follow-up research could simultaneously consider the institutional arrangement of REDD+ finance under the Paris Agreement regime to analyze the fragmentation and make policy recommendations.

6. Conclusions

The importance of REDD+ for climate change mitigation and adaptation is expected to be increased in the Paris Agreement regime. Under the Kyoto Protocol Regime, various donors have committed REDD+ finance to support the implementation of REDD+ in developing countries. Voluntary and independent commitments without coordination have led to fragmentation and related inefficiencies in REDD+ finance. Therefore, we analyzed the fragmentation of REDD+ finance conducted under the Kyoto Protocol Regime and provided recommendations for coordination under the new Paris Agreement regime. The fragmentation of REDD+ finance among recipient countries was relatively reduced when compared to that of ODA, as the majority of the supported finance came from a few major donors. The fragmentation of bilateral REDD+ finance was higher than that of multilateral REDD+ finance, as developed country donors tend to concentrate supports to recipient countries that are favorable to the fulfillment of their own motivations.

Therefore, the fragmentation of REDD+ financing explains both the inefficiency of aid allocation, which can be improved through aligned supports, and the diversity of REDD+ finance, which shows accessibility to the support. Some REDD+ countries have made progress in national REDD+ and accomplished emission reductions; however, there are still many countries developing elements of WRF, and the other countries are in the very early stages of implementing national-level REDD+. Thus, REDD+ finance needs to be stratified in consideration of the progress of national REDD+.

Most developing countries are still in the REDD+ preparation phase and require more finance to increase their capacity. For these countries, aid for participating in REDD+ and developing and implementing elements of WRF can be delivered by donors, including developed countries and climate funds. For the REDD+ countries in phase 3, which have satisfied elements of WRF and registered the results, incentives can be delivered to encourage them to achieve more ambitious reductions. REDD+ finance for those purposes can be delivered by multilateral funds, such as the GCF, to reduce transaction costs and enable the coordination of REDD+ cooperation. Cooperative approaches can be another useful option for REDD+ countries in phase 3 and partner countries seeking ITMOs, enabling the REDD+ countries to secure resources to scale up national REDD+ support and the partner countries to achieve cost-effective mitigation.

For such forms of cooperation, an information-sharing and monitoring system that collects information on ongoing REDD+ cooperation, the commitment and expenditure of REDD+ finance, and the support needs of REDD+ countries at a global level should be established. Based on such a system, donors may provide aligned and predictable REDD+ supports and develop cooperation strategies that are functionally differentiated in consideration of their available amount of supports and WRF progress of the REDD+ countries. Multilateral organizations need to provide safeguarding functions for developing countries that are isolated from the bilateral REDD+ finance.

Author Contributions: Conceptualization, D.-h.K. (Dong-hwan Kim) and R.K.; methodology, D.-h.K. (Dong-hwan Kim) and D.-h.K. (Do-hun Kim); software, D.-h.K. (Dong-hwan Kim); validation, D.-h.K. (Dong-hwan Kim) and D.-h.K. (Do-hun Kim); formal analysis, D.-h.K. (Dong-hwan Kim); writing—original draft preparation, D.-h.K. (Dong-hwan Kim) and D.-h.K. (Do-hun Kim); writing—review and editing, H.S.K. and R.K.; supervision, H.S.K. and R.K. All authors have read and agreed to the published version of the manuscript.

Funding: This study was carried out with the support of “R&D Program for Forest Science Technology (Project No. AP00000523)” provided by Korea Forest Service (Korea Forestry Promotion Institute) and funded by the National Institute of Forest Science (NIFoS) (FM0200-2019-01).

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data presented in this study are available on request from the correspondence author.

Conflicts of Interest: The authors declare no conflict of interest.

Abbreviations

ER(s)	Emission Reduction Result(s)
FAO VRD	Food and Agricultural Organizations Voluntary REDD+ Database
FREL(s)/FRL(s)	Forest Reference Emission Level(s)/Forest Reference Level(s)
GCF	Green Climate Fund
ITMO(s)	Internationally Transferred Mitigation Outcome(s)
MRV	Measuring, Reporting, and Verification
NDC	Nationally Determined Contribution
NFMS	National Forest Monitoring System
NSAP	National Strategy and Action Plan
ODI CFU	Overseas Development Institute Climate Funds Update
RBP(s)	Results-based payment(s)
REDD+	Reducing Emissions from Deforestation and Forest Degradation, as well as fostering conservation, sustainable management of forests, and enhancement of forest carbon stocks
SIS	Summary of Information on Safeguards
WRF	UNFCCC Warsaw Framework on REDD+

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