⏭ FAST FORWARD: CHALLENGES TO SCALING THE VOLUNTARY CARBON MARKET

thallo

About project timelines, financing, inefficiencies in the value chain and forward models

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KEY FINDINGS

CREDITING PROGRAMS AND VVBs ARE KEY BOTTLENECKS

- Eliminating unnecessary validation and verification wait times could double the speed of credit issuance
- Verification-related delays will cost project developers $2.6B and will prevent issuance of 4.8 GT credits by 2030

FINANCING IS A BARRIER

- Financing is another key challenge, especially for small to mid size project developers
- Most prevalent financing methods include forward purchase agreements and own funding
- 90% of contributors agree that forward products will be key to scaling the VCM

INTERMEDIARIES CAPTURE SIGNIFICANT VALUE

- Investors and intermediaries such as brokers and retailers make up 1/3 of average credit price, i.e. $650M in 2021

CONTENT

RESEARCH METHODOLOGY

CONCLUSION

DEVELOPMENT PROCESS

- Phases and timelines
- Bottlenecks
- Cost associated to these bottlenecks
- Suggested solutions

FINANCING METHODS

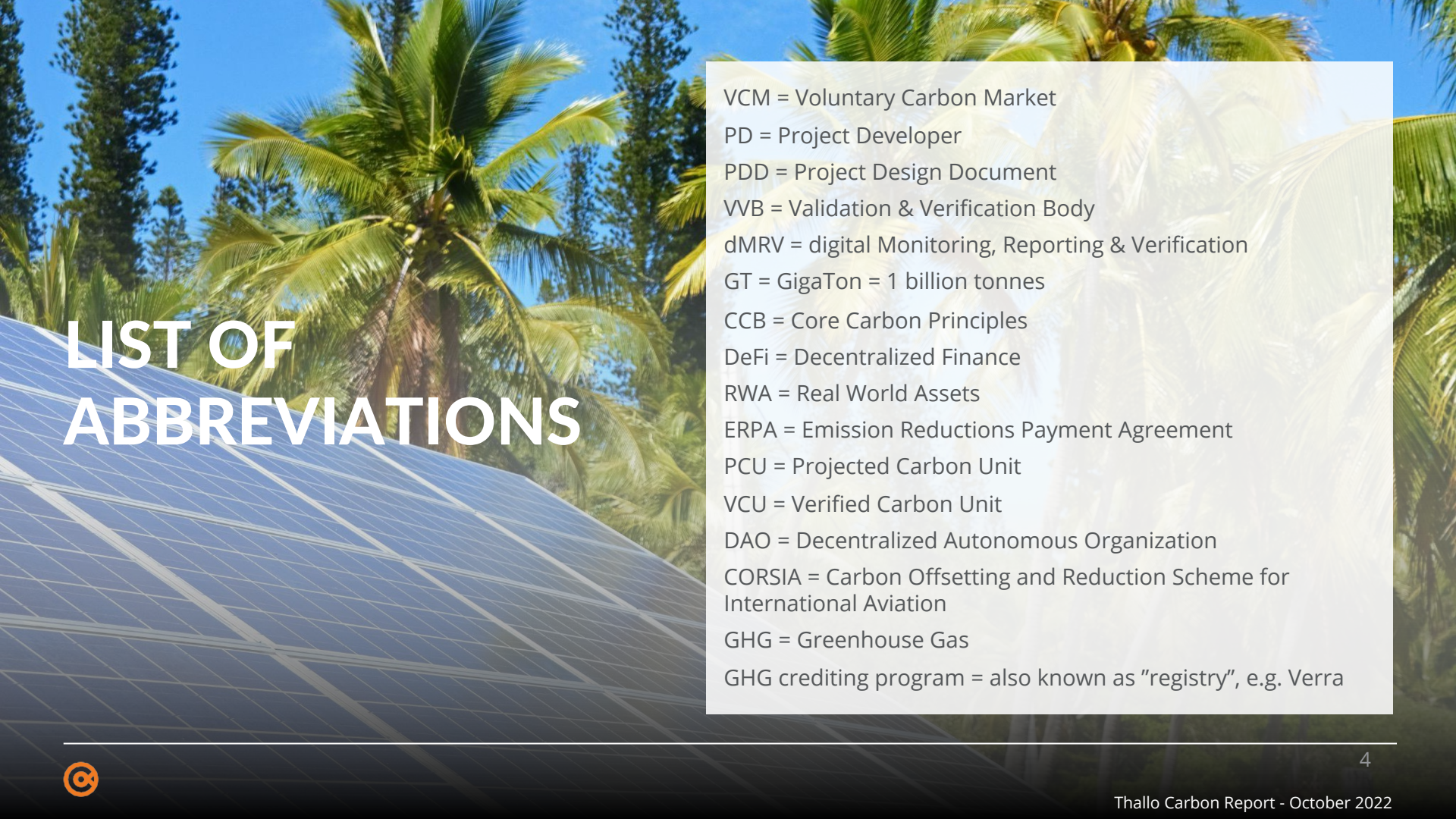
- Overview of financing methods and occurrence
- Challenges associated with each method
- Best solution for an accelerated development process

VALUE CHAIN

- Repartition of revenues along the value chain
- Cost associated to inefficiencies in the value chain

FORWARD FINANCING

- Forward models currently under development in web3
- Futures models existing on web2 and new registry products
- Proposal for a new developer-centric forward model



LIST OF ABBREVIATIONS

VCM = Voluntary Carbon Market

PD = Project Developer

PDD = Project Design Document

VVB = Validation & Verification Body

dMRV = digital Monitoring, Reporting & Verification

GT = GigaTon = 1 billion tonnes

CCB = Core Carbon Principles

DeFi = Decentralized Finance

RWA = Real World Assets

ERPA = Emission Reductions Payment Agreement

PCU = Projected Carbon Unit

VCU = Verified Carbon Unit

DAO = Decentralized Autonomous Organization

CORSIA = Carbon Offsetting and Reduction Scheme for International Aviation

GHG = Greenhouse Gas

GHG crediting program = also known as ”registry”, e.g. Verra

RESEARCH METHODOLOGY

15 INTERVIEWS WITH PROJECT DEVELOPERS

- Mid to Large size
- REDD+, AFOLU, Cookstoves, Mangroves, Enhanced Weathering, Renewable Energy, Carbon Capture
- Latin America, USA, Europe, Asia & Africa
- Survey for additional input

16 INTERVIEWS WITH VCM EXPERTS

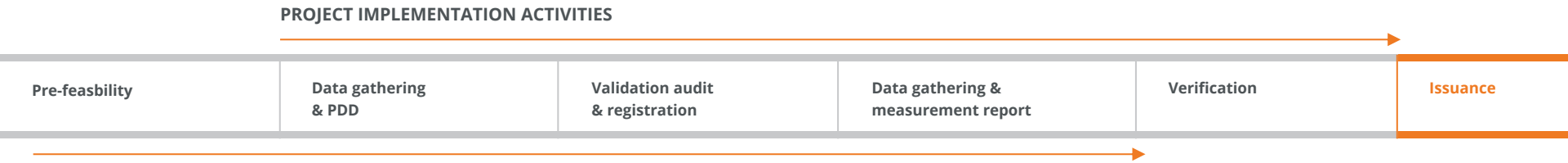
- GHG crediting programs
- Advisory institutions
- Investment and trading firms
- Web3 projects
- Insurers

EXISTING LITERATURE

- Referenced in footnotes

DEVELOPMENT PROCESS AND SOURCES OF DELAY

THE OFFSET DEVELOPMENT PROCESS CONSISTS OF FIVE PHASES AND CAN LAST BETWEEN 1.5 AND 6 YEARS



Pre-feasibility or project origination: Duration depends on PD expertise: experienced PD's quickly determine the potential of a project, while less experienced PD's require help of a consultant. A certification standard must also be selected. Stakeholder conversations are initiated.
→ Duration: 1 month – 1 year

Data gathering & PDD: Necessary data must be collected to create a PDD. This is usually done by the PD, who transfers the data to a consultant who writes the PDD. This document contains a detailed description of the project, complex calculations to determine the amount of carbon avoided over the years, a business plan, etc. Project implementation activities start in parallel.
→ Duration: 6 months – 1 year

Validation audit & registration: The finished PDD gets validated by a third-party auditor. With their approval, the project is submitted for review at a GHG crediting program. Now the crediting program recognizes the right for the project to issue X amount of credits if execution happens according to the PDD.
→ Duration: 2 - 18 months

Data gathering & measurement report: As project activities are reaching cruise speed, constant monitoring needs to happen to measure whether the project is delivering as expected. An auditor summarizes everything in the measurement report. Depending on project type, this can take several months to several years.
→ Duration: 4 months – 2 years

Verification: The final report is sent to the GHG crediting program for verification. They compare the final report with the PDD, verify whether everything has been executed according to standard and compute the final volume of credits generated. When verified, credits can be issued upon payment of issuance fee.
→ Duration: 1-6 months

BIGGEST BOTTLENECKS ARE RELATED TO VERIFICATION AND GHG CREDITING PROGRAMS

"

"Consultants and registries take a lot of time. We wish we could set a timeline for them."

"Registries lose time because there is such a big variety in the quality of work delivered by different VVBs."

"The registries are looking for professionals in the field of enhanced weathering."

"Data collection is crucial: it takes a lot of time and if it's not well done, the whole project is undermined."

"It's hard to book available VVB's and they take a long time to execute; They are probably responsible for half of the delay"

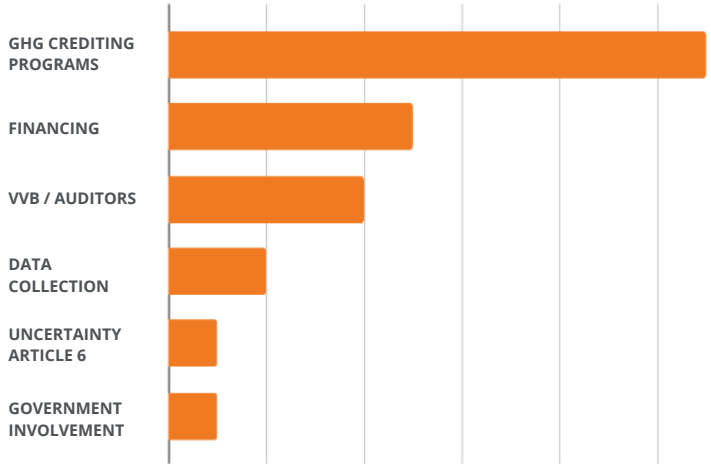
"The problem is that all big developers poach employees from the registries. It's a human capital problem."

"We work with national standards for some projects because it is faster, even though we must sell our credits at a lower price."

"One of the huge inefficiencies is that you need to do data gathering, and you must do it multiple times during the project."

PD SURVEY

WHAT ARE THE BIGGEST BOTTLENECKS IN THE DEVELOPMENT PROCESS?



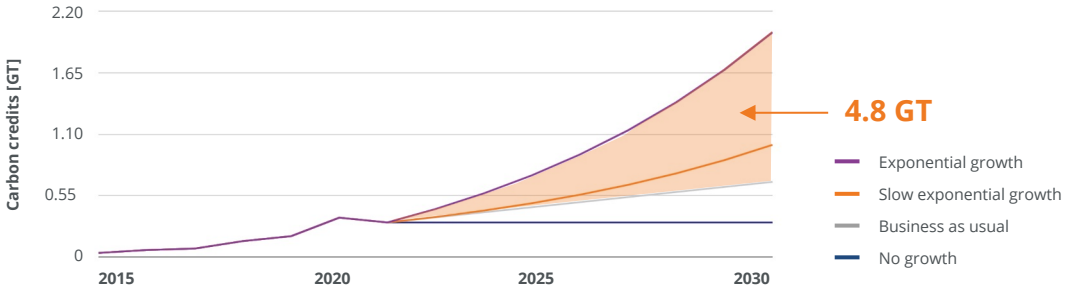
VERIFICATION DELAYS COULD RESULT IN A 4.8 GT COST TO THE PLANET AND AN INDIRECT $2.6B COST FOR PDs

> "Solving these bottlenecks could reduce the time needed to issue offsets to less than half." - Multiple PD's

PLANET

Every delay in the start of a new project, costs the planet precious time. If registries and VVBs are not able to follow the increase in supply, this could cost the planet 4.8 GT until 2030. This is equivalent to not offsetting **37 million US citizens[1] during the same 8-year period.**

CARBON CREDIT ISSUANCE SCENARIOS[2]



PROJECT DEVELOPER

Consequences of having to wait until credits are issued:

- Demotivation of core team and local communities
- Other means of funding must be found to pay for the maintenance of the project
- There is no cash to start a next project
- In some cases, the co-benefits of a project can only be realized after revenues are earned

$2.6 BILLION

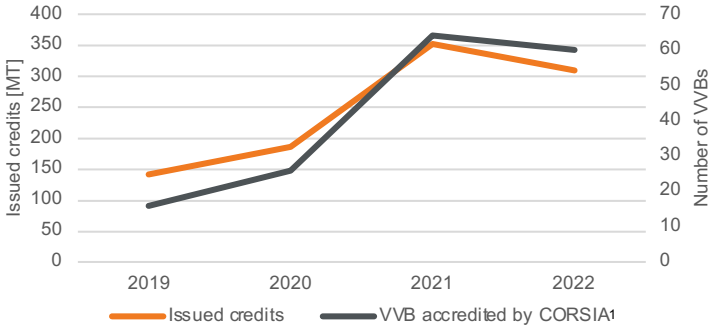
Total cost of delays for project developers until 2030[3]

1 Assuming a carbon footprint for US citizens of 16 ton/year
2 Exponential growth: Optimistic ICVCM scenario / Slow exponential growth: Pessimistic ICVCM scenario / Business as usual: linear growth according to 2016 -2022 average / No growth: capped at 2022 capacity
3 OPEX cost of 0.7 $/ton/year and a WACC 5% based on *Exponential growth*-scenario volumes

VVBs CONTRIBUTE TO THE ISSUE AND MUST BE PART OF THE SOLUTION

Possible solutions	
Crediting programs scale up	Increase workforce to match the demand
Improve the feedback loop between VVBs and crediting programs	Focus on improved communication between registry and PDs & VVBs to enable faster problem-solving
Agreement on baseline methodologies across big and small crediting programs	Convergence of methodologies will make the verification process easier for all market participants and will give smaller registries the opportunity to take over a part of the capacity from the bigger ones
Increased flexibility and simplification of methodologies	Methodologies used by Verra & Gold Standard are demanding and do not always fit all project types and sizes. Sometimes it is not feasible to gather data in the required format. Small methodology deviations should be allowed, without compromising for quality if that is possible
Improved technology (dMRV, dedicated software, blockchain)	Specialized software replaces the use of inefficient spreadsheets; dMRV reduces the need for human intervention; blockchain ensures traceability of issuance, transactions and avoids double counting
Use of jurisdictional baselines	In PDD creation, calculating the baseline introduces a lot of complexity. If jurisdictional baselines could be used it would save a lot of time for both developer, VVB and carbon credit issuers

NUMBER OF VVBs CORRELATES TO CREDIT ISSUANCE



GHG crediting programs argue that there **are too few VVBs** compared to the number of projects. Additionally, in what they deliver **quality is declining[2],** which increases processing times. Verra and Gold Standard **are aware** of the delays in verification[3] and **are acting** to solve this by creating a specific team to improve technical capacities of VVBs and national accreditation entities through dedicated training, tightening review of projects by pushing back earlier on poor quality projects and working more collaboratively with accreditation entities.

1 CCR Info Data Transparency Part 1: List of verification bodies accredited in states
2 Source: Verra. Possible reasons could be increased VVB demand while they are experiencing capacity limitations and/or increased margin pressure
3 Their statements and improvement plans can be found here: https://verra.org/april-newsletter-3/, https://www.goldstandard.org/blog-item/project-developer-output-report

The solutions mentioned on the previous slide are not mutually exclusive. In fact, the best solution would be a combination of all.

The goal is for *nature* to be the bottleneck

However, even if the crediting program, VVB and data gathering bottlenecks are addressed, there will still be new challenges arising such as **securing the necessary financing.**

FINANCING: TYPICAL MODELS AND IMPLICATIONS

FORWARD PURCHASE AGREEMENTS AND OWN CAPITAL ARE MOST COMMON WAYS OF FUNDING

FORWARD PURCHASE AGREEMENT

OWN CAPITAL

DIRECT EQUITY

GRANT / DONATIONS

DEBT

COMMENTS

- Often a combination of methods applies
- Established PDs and known methodologies have easier access to funding - for new methodologies and small developers it is much more difficult → 'chicken and egg'-situation
- Financial jargon causes confusion about what each method means, and how they are used
- Costs occur in tranches over the lifetime of a project, there is no need to get a big amount of capital upfront
- Within the interviewed audience, no two forward agreements are the same - **two examples are to the right**

EXAMPLES OF FORWARD FINANCING MODELS

EX. 1: AGREEMENT WITH BUYER WHO UNDERSTANDS THE MARKET AND ACCEPTS FLEXIBLE TERMS

- PD and investor sign ERPA
- PD shares estimation of total development cost
- Both parties agree on a range of credits to be delivered
- Dialogue remains possible in case of late delivery or other challenges that arise
- Worst case, developer must return the money

EX. 2: AGREEMENT WITH BUYER WHO SHARES IN THE RISK

- Investor gives significant amount of capital and takes part of the risk; in return has the option to buy credits for 5 years
- Credit price is not yet known; prepayments will be deducted from final price
- If investor makes a profit by selling the credits, PD does not share in the upside

EACH METHOD HAS BENEFITS & CHALLENGES: A VIEW FROM THE PROJECT DEVELOPER'S PERSPECTIVE

Method	Definition	Challenges	Benefits
Forward purchase agreement	Buyer provides interim finance to enable development in return for carbon credits. On credit issuance, the buyer may or may not have to pay a final balancing payment on the value of the offset	• Risky because no credits exist yet • There is no standardized methodology • PD must often sell their credits at a discount to account for this risk[1]	• Risk is shared with the buyer • In most cases, PD has a guarantee that (a part of) their credits will be sold • Creates liquidity for PD to develop project
Own capital	PD funds the development with own capital, e.g. their savings, house mortgage, …	• PD bears all the risk • Own capital often not enough to scale up	• Cheap • Full control
Grants & donations	Charities donate money or governments award grants to develop carbon credits. Only return consideration is that money should be used to develop these projects	• Grants and donations do not come in sufficient quantities to depend only on them	• Cheap • Full control
Debt	PD borrows money which is to be paid back with interest at a future date and they have to arrange a collateral.	• Impossible to get debt financing for carbon projects in the developing world; not evident in the West • Expensive and complex	• Full control
Direct equity	PD sells shares of the carbon development project in return for capital	• PD loses part of the control over project • Exit strategy needs to be provided	• Money received does not have to be paid back

1 Example of discount amounts: 60% before pre-feasibility, 40% before PDD drafting, 20% before registration, 0% after registration

PREFERRED SOLUTION FOR PDs DEPENDS ON THEIR SIZE & EXPERIENCE - AND CAPEX INTENSITY OF PROJECT

BIG & EXPERIENCED

Experienced at technical write-up of documents, global presence, more diversified, >5M credits/y

- Long-term contract agreements with investors
- Advantageous loan structures Investments from trading houses, end buyers, big conglomerates

→ Finding funding is not a real challenge

Next step: taking carbon companies public

"Green14", a spin-off from Space for Giants, to go public on NYSE in October 2022

INTERMEDIATE

Have typically developed one or more projects, more niche markets, 0.25-5M credits/y

- Like to keep full autonomy and don't want a huge sum of money upfront, because that is expensive
- Would like to have a guarantee that at least a part of the credits will be sold at a certain floor price, with a share in the upside
- Prefer simple agreements from investors who understand the business

Required capital from forward funding depends on project type: e.g. reforestation requires more than REDD+

SMALL & NEW

New to the business, high-risk, difficult to scale, <0.25M credits/y

- Need starting capital for their first project
- Start in the pre-feasibility stage, need to pay advisors
- Must prove themselves before they can start scaling up

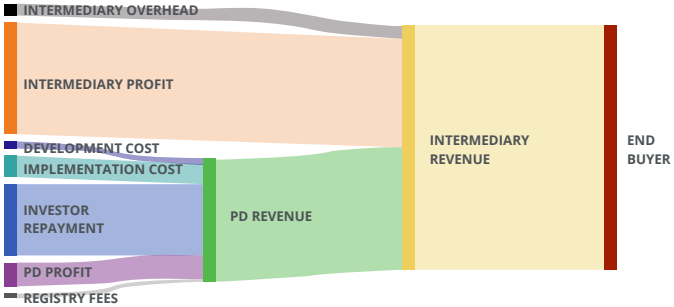
→ "For us, the first $100,000 is much harder to raise than the next $10 million"[1]

Everything relates to risk

1 https://www.linkedin.com/pulse/early-stage-finance-bottleneck-vcm-explained-flowcarbon/

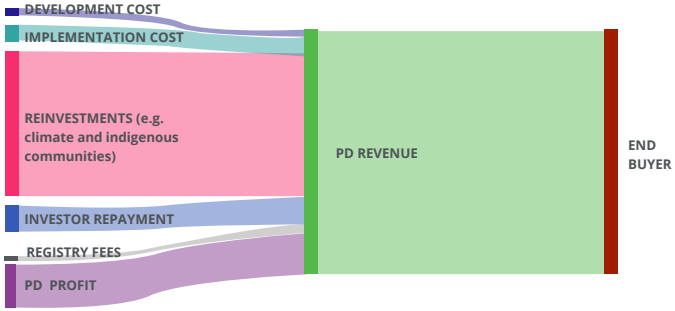
VALUE CAPTURE ALONG THE VALUE CHAIN

BREAKDOWN OF REVENUES ALONG THE VALUE CHAIN VARIES DEPENDING ON THE PROJECT



WORST CASE

- PD's estimate that intermediaries like brokers take 10% on average, but are not completely aware
- Research revealed credits where intermediaries take markups that exceed 100%[1]



BEST CASE

- PDs sell directly to the end customer without the need for an intermediary like a broker
- Up to 60% of revenues is reinvested into climate or goes back to indigenous communities to assure long-lasting impact. This could be in cash or in kind. Part of the co-benefits are related to project maintenance; the other part is completely detached (e.g. providing healthcare)

GENERAL

- Whole range between the worst and best case is possible
- Intermediaries are "good", when they provide an added value at a reasonable cost, whereas "bad" intermediaries charge a lot without doing anything useful
- Investor repayment ratio depends on financing model
- Development cost includes prefeasibility, stakeholder consultation, carbon baseline modeling, PDD drafting, validation, ...
- Implementation costs include land acquisition, administrative costs, monitoring, planting/establishment, ...

1 Reach out to Thallo for concrete examples

INTERMEDIARIES AND INVESTORS PROFITS ACCOUNT FOR ONE-THIRD OF VCM MARKET TRADED VALUE IN 2021

AVERAGE CREDIT PRICE OF 4$/t IN 2021 CONSISTED FOR 33% OF INVESTOR AND INTERMEDIARY FEES:

WITH 500,000,000 CREDITS TRADED IN 2021[3], THIS ACCOUNTED FOR $650 MILLION OF TOTAL MARKET VALUE

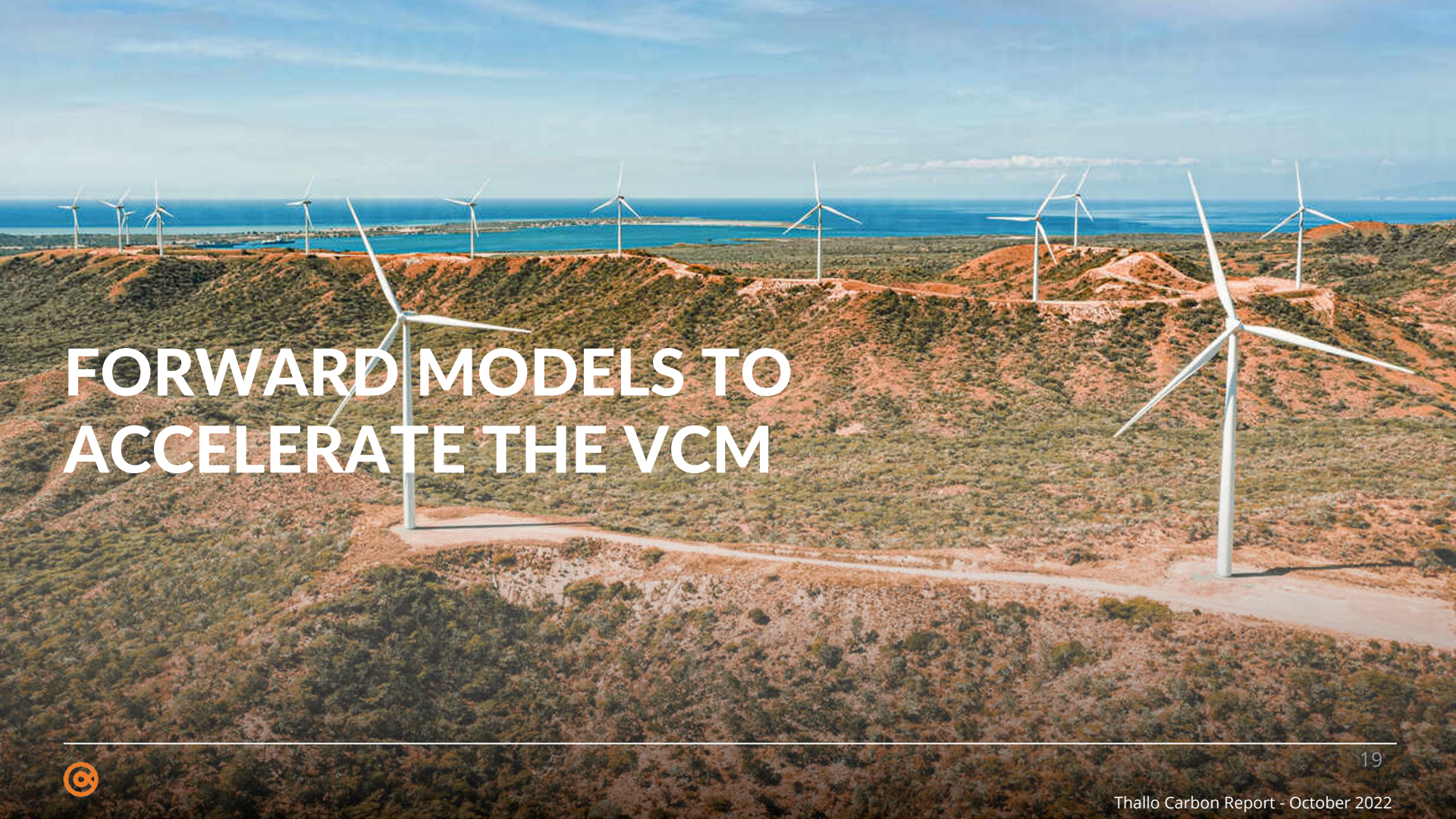
WHY DO PDs WORK WITH BROKERS THEN?

- "Help to connect to buyers"
- "Convenient for price discovery"
- "Sale of less qualitative credits"

VALUE OF A WELL FUNCTIONING EXCHANGE

- Connect buyers and sellers without taking large fees
- Give clear price signals
- Provide transparency around quality of credits

1 Assuming investor repayment can be reduced from 28% on average to 10% of final credit price, this reduces the investor repayment fee with $0,7
2 Assuming 35% of credits are sold directly to end customers, 50% are sold through intermediaries who take 10% mark-up, 15% are sold to intermediaries who resell at 80% mark-up
3 Volume and average price are taken from Ecosystem Marketplace's "The Art of Integrity – State of the Voluntary carbon Markets 2022 Q3"



FORWARD MODELS TO ACCELERATE THE VCM

FORWARDS AND FUTURES: BACK TO BASICS, APPLICATION IN THE VCM AND RELEVANT PLAYERS

DEFINITIONS

Futures contracts are standardized contracts that trade on exchanges. As such, they are settled daily, come with fixed maturity dates and uniform terms. There is little risk with futures, as they guarantee payment on the agreed date. Vintages are not necessarily in the future.

An **OTC forward contract** is an arrangement that is made over-the-counter (OTC) and settles just once at the end of the contract. Both parties involved in the agreement negotiate the exact terms of the contract. It is privately negotiated and comes with a degree of default risk since the counterparty is responsible for remitting payment. The vintage of the credit is in the future.

IN VCM, FORWARDS ARE MORE RELEVANT THAN FUTURES TO HELP DEVELOP PROJECTS FASTER

- Carbon projects are inherently different. This makes it hard to create standardized futures contracts
- Forward contracts can be closed earlier in the life cycle of a carbon project, providing much-needed financial support to early-stage projects
- The volume of forward transactions have increased 65% between 2020 and 2021[1]

1 Source: Ecosystem Marketplace "The Art of Integrity – State of the Voluntary carbon Markets 2022 Q3"

DIFFERENT FORWARD MODELS UNDER DEVELOPMENT IN WEB3 SPACE - SOME HELP TO ACCELERATE MORE

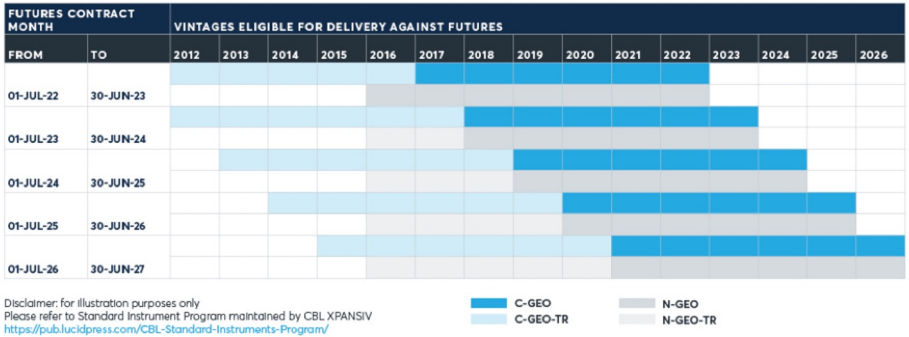
INCREASING PROJECT ACCELERATION

	Pooling	Eligible stage	De-risking method	How it works	Additional information
Ivy	No	Before pre-feasibility to whenever later	Small ticket size, donations as buffer, developer ratings, funding in tranches	PDs can get funding in a matter of days – additional revenue can be obtained with reporting duties	Their own pool of validators help projects through pre-feasibility and registration
CARBON.fi	No	From the start of a project since it's chosen by the DAO	Basic supply-chain management in relation to impermanent loss	Will have their own community of PDs and a pool of projects. Capital comes from revenue of previous sales.	Governance token holders decide on credit price and projects to be developed
GREENTRADE	No	Any stage	Due diligence and careful curation of any nature based projects	GreenTrade turns long-term offtake agreements into digital tradeable assets through the use of ERPA's	Corporate buyers reduce future price and access risk, while PDs secure funding for new projects
Solid World	Yes, per type: mangrove and ARR	*More information to be released closer to launch date*	Due diligence, delivery risk assessment, governance approval. Buyer can get their money back at any time.	Tokenized agreements carry the promise of delivery from a specific carbon project and relevant fallback scenarios in case of non-delivery. Delivery through Toucan or Flowcarbon.	Goal is to have a public spot price for forward assets / Structures like loan facilities, self-repaying loans denominated in carbon, ...
Flowcarbon x Centrifuge	Yes	After registration	Pooling, partial payment mechanisms (1/2 upon delivery), heavy due diligence on the projects	Capital from senior investors (70%) who get a guaranteed return and junior investors (30%) who get the rest	Pool will launch on Centrifuge's Tinlake, the open DeFi protocol and RWA marketplace

WEB2 EXCHANGES AND REGISTRIES' FUTURES DON'T INTERVENE EARLY ENOUGH IN THE PROCESS

FUTURES

- Pooled approach; firms taking delivery receive a credit from a registry and project following CORSIA criteria
- Mitigated counterparty risk, robust audit trail for compliance, efficient price execution and transparent settlement process
- Products CBL: GEO, N-GEO (nature based), C-CEO (tech, CCP based), ICE: NBS
- Vintages eligible for delivery against futures CBL → Vintages of ICE are 2017-2030



PROJECTED CARBON UNIT (PCU)

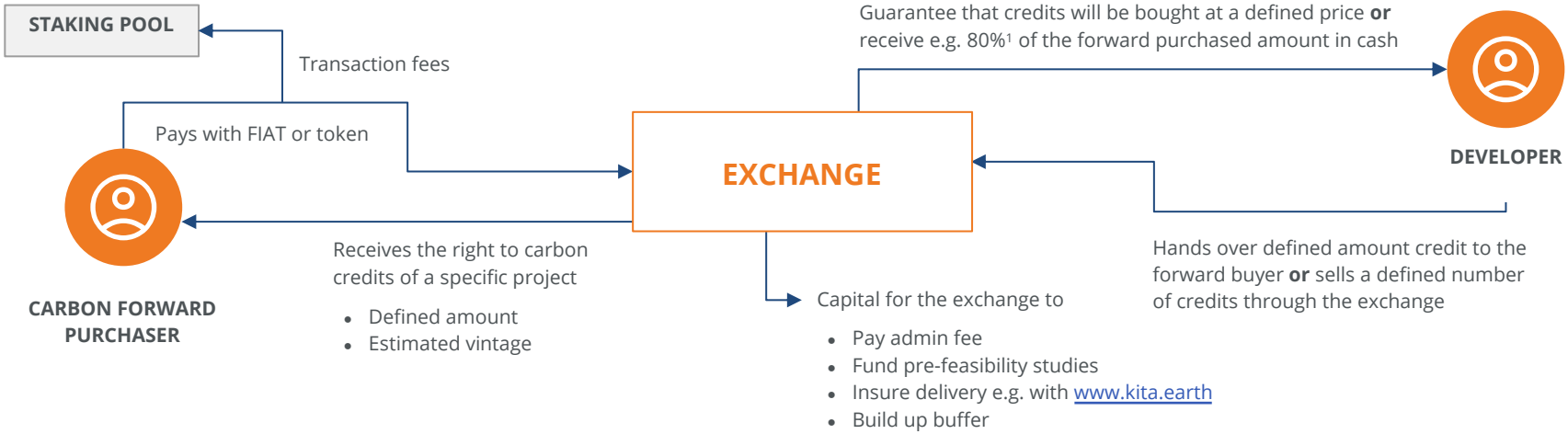
Projected Carbon Unit (PCU) Represents one tonne of carbon reductions or removals that a registered project is expected to achieve according to its validated projections. PCUs will be assigned on request to project proponents after project registration and will be converted automatically into VCUs following Verra's approval of the verification.

PLANNED EMISSIONS REDUCTION (PER)

Gold Standard enables the registration of number of expected emission reductions following project performance certification to a limit of five years forward using scientific calculations to ensure that the quantity is not overestimated. These are registered as 'Planned Emission Reductions'. and can be traded but not retired. Once the emission reductions have been verified, these units are Verified Emission Reductions and may be retired and used for carbon or climate neutrality claims.

Securing financing is the most difficult *before* projects have passed validation.
Futures based on registered projects do not help to lower the barrier for financing in the phase when it is most needed.

PROPOSAL FOR A SMALL TO MID SIZE PROJECT DEVELOPER FOCUSED FORWARD MODEL



- Gives PD flexibility
- Accelerates project development
- Strong relationship between exchange & PD

- Complex
- Some pre-feasibility investments will be worthless
- Risk mitigation for late or non-delivery
- Required registration with FCA (regulator) is a legal hurdle

1 This figure would depend on the likelihood of projects to succeed, which Thallo is researching

CONCLUSION

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The Voluntary Carbon Market is changing rapidly

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Many challenges are yet left to be conquered, above all scaling verification and improving access to early-stage financing. We must work towards a more mature and financeable VCM.

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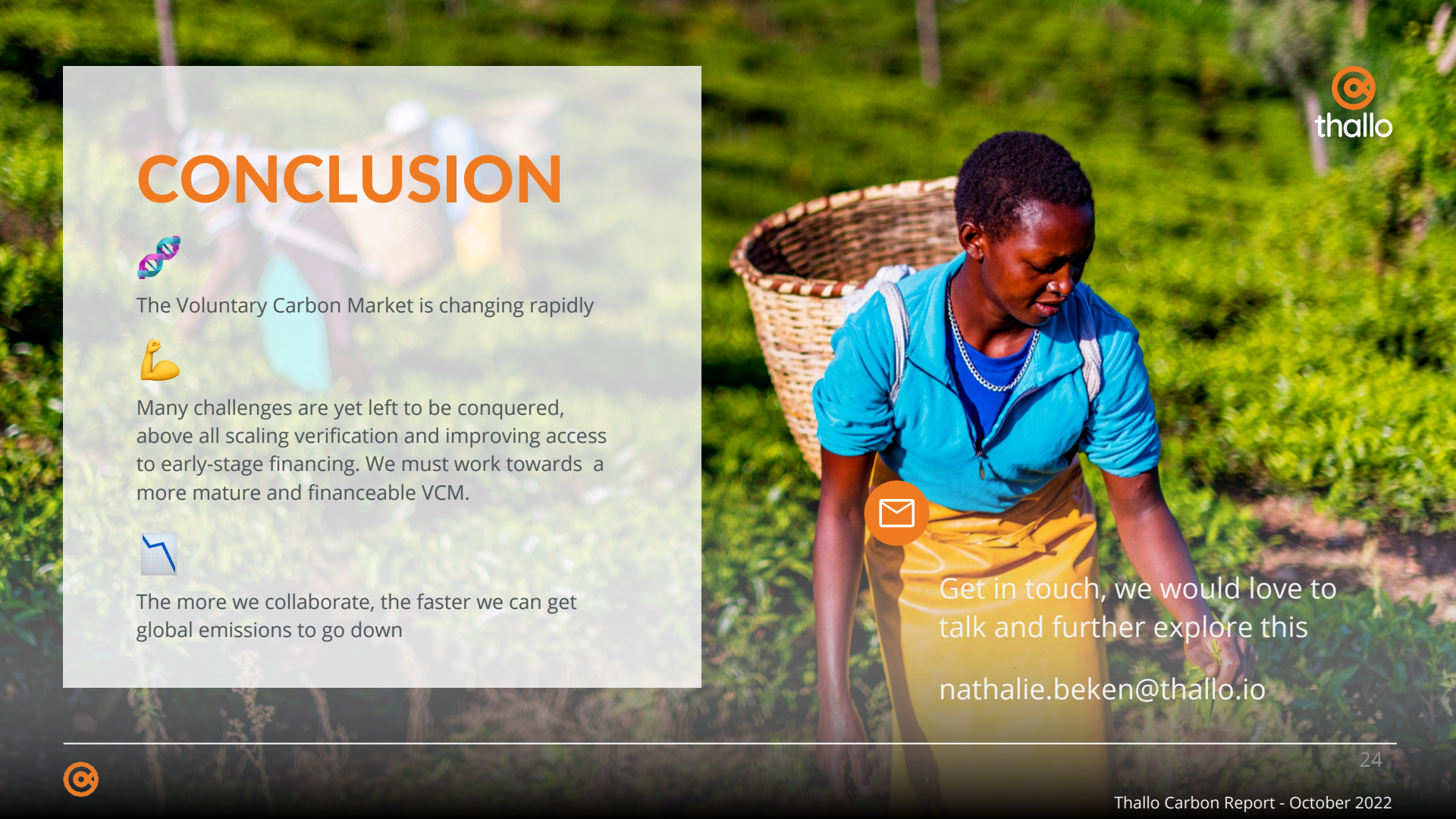
The more we collaborate, the faster we can get global emissions to go down



Get in touch, we would love to talk and further explore this

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SPECIAL THANKS TO THE REPORT CONTRIBUTORS

PROJECT DEVELOPERS

carbontanzania · FAIRATMOS · Inherit · FOR TREES CLUB
UNDO · BIOFIX · BCP · ClimeTrek
Inplanet · SPACE FOR GIANTS · Udaipur Urja Initiatives · The BLUE CARBON INITIATIVE
eco securities · Greenoxx greening the future · AIDER Bosque manejado ¡Futuro asegurado!

OTHERS

Ivy · Respira · TREND 2e · CLIMATE FOCUS
Carbon CHECK · Fix6 · CARBON.fi · CARBON-PLUS CAPITAL BIOCARBON FINANCE
Kimmeridge · Kita · Solid World · GREENTRADE
ripple · VERRA · EcoRegistry. · ICR International Carbon Registry

AND THE WHOLE thallo-TEAM!