

Week 1: Green Finance Foundations

Professional Certificate in Green Finance

14 contact hours — Sessions: Intro, Ecosystem, Instruments, Financial Fundamentals

Introduction to Green Finance

What is Green Finance?

Definition

- Financial investments supporting environmental sustainability
- Capital directed to climate action and ecological objectives
- Integration of environmental criteria into financial decisions
- Risk-adjusted returns with measurable impact

Key Characteristics

- Environmental additionality
- Transparency and reporting
- Third-party verification

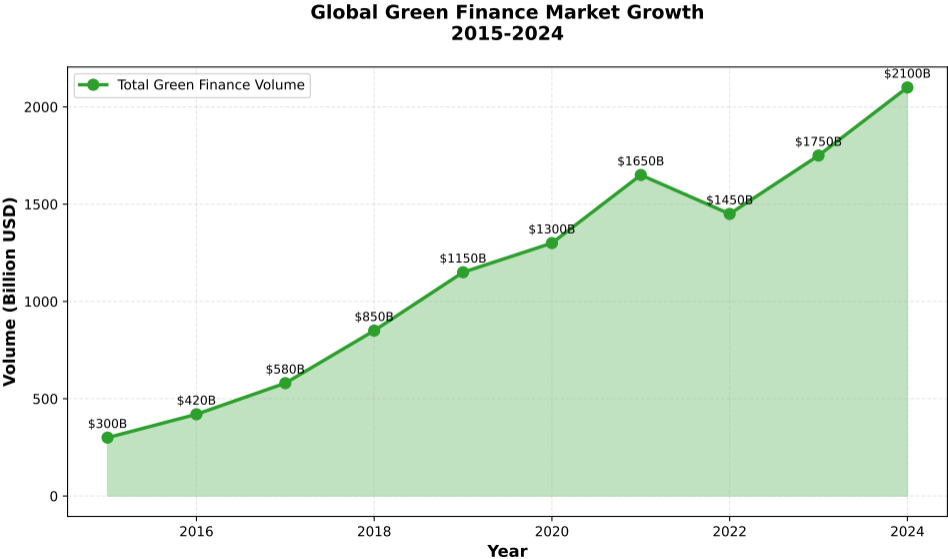
Scope of Green Finance

- Climate change mitigation
- Climate change adaptation
- Pollution prevention and control
- Biodiversity conservation
- Sustainable resource use
- Circular economy

Market Scale (2024)

- Total: 5+ trillion USD annually
- Green bonds: 1.6 trillion USD outstanding
- Growth: 30-40% per year

Green finance channels capital to activities with positive environmental outcomes while maintaining financial viability



Climate Imperative

- Paris Agreement: limit warming to 1.5-2C
- Required investment: 3-5 trillion USD/year
- Current gap: 2-3 trillion USD/year
- Financial system must mobilize capital

Financial Risk

- Physical risks: extreme weather, rising seas
- Transition risks: policy, technology shifts
- Stranded assets: 1-4 trillion USD at risk
- Systemic financial stability concerns

Business Opportunity

- Clean energy market: 10+ trillion USD
- First-mover advantages
- Innovation in sustainable tech
- Growing investor demand

Regulatory Drivers

- EU Taxonomy and SFDR
- SEC climate disclosure rules
- Central bank climate stress tests
- Mandatory TCFD reporting globally

Green finance addresses climate urgency while creating significant economic opportunities and managing financial risks

Early History (Pre-2007)

- 1990s: Socially responsible investing (SRI)
- 2000: UN Global Compact launched
- 2006: UN Principles for Responsible Investment

Emergence (2007-2015)

- 2007: First green bond (EIB, 600m EUR)
- 2014: Green Bond Principles
- 2015: Paris Agreement catalyst

Mainstreaming (2015-2020)

- 2017: TCFD recommendations
- Explosive green bond market growth
- Central banks engage climate risk

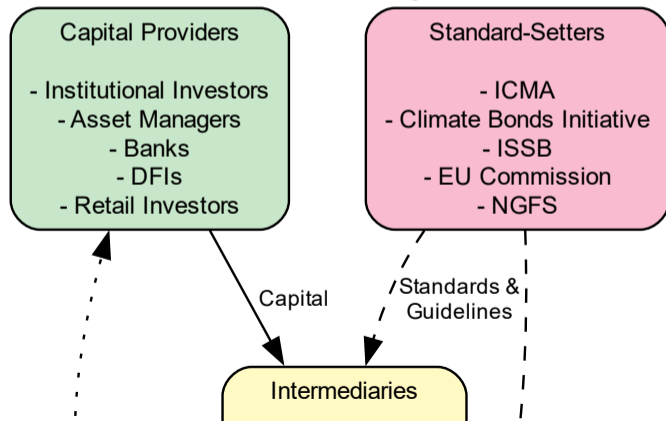
Maturation (2020-Present)

- 2021: EU Taxonomy implemented
- 2022: SFDR disclosure requirements
- 2024: Regulatory frameworks solidify
- Focus shifts to impact and credibility

Green finance evolved from niche ethical investing to mainstream financial practice driven by climate science and regulation

Green Finance Ecosystem

Green Finance Ecosystem Map



Capital Providers

- Institutional investors (pensions, insurance)
- Asset managers and funds
- Commercial banks
- Development finance institutions
- Retail investors

Intermediaries

- Investment banks (underwriting)
- Rating agencies
- Verifiers and certifiers
- Stock exchanges

Capital Recipients

- Sovereign governments
- Corporations (green bonds, loans)
- Project developers (renewable energy)
- Municipalities
- Financial institutions

Standard-Setters

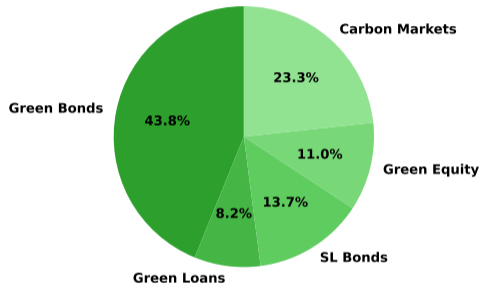
- ICMA (Green Bond Principles)
- Climate Bonds Initiative
- ISSB (sustainability standards)
- EU Commission (Taxonomy)

Diverse participants create a complex ecosystem requiring coordination through standards and regulations

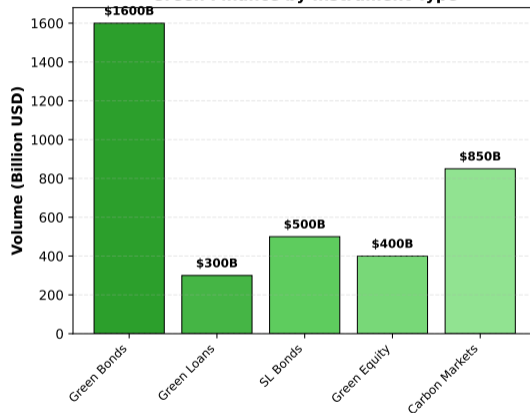
Green Financial Instruments

Green Finance Instruments Overview

**Green Finance Instruments
Market Share (2024)**



Green Finance by Instrument Type



Green bonds dominate the market at 1.6 trillion USD, followed by carbon markets and sustainability-linked instruments

Definition and Structure

- Fixed-income securities
- Proceeds dedicated to green projects
- Same credit risk as issuer
- Use-of-proceeds restriction

Eligible Categories

- Renewable energy
- Energy efficiency
- Clean transportation
- Green buildings
- Sustainable water management

Key Features

- External verification (common)
- Regular impact reporting
- Separate tracking of proceeds
- Alignment with GBP or standards

Market Size

- First issuance: 2007 (EIB, 600m EUR)
- 2023: 450 billion USD issued
- Outstanding: 1.6 trillion USD
- Top issuers: Germany, France, US, China

Green bonds provide transparent, verifiable financing for environmental projects with market-rate returns

Key Difference from Green Bonds

- No use-of-proceeds restriction
- General corporate use allowed
- Financial terms tied to KPIs
- Broader issuer base (any industry)

Structure

- Define Sustainability Performance Targets
- Select Key Performance Indicators
- Coupon step-up if targets missed
- Example: +25 bps if emissions target unmet

Common KPIs

- GHG emissions reduction (Scope 1, 2, 3)
- Renewable energy share
- Water usage reduction
- Waste reduction / circularity

Benefits and Concerns

- Pro: Incentivizes corporate-wide change
- Pro: Flexible for all sectors
- Con: Potential for weak targets
- Con: Greenwashing risk

Sustainability-linked bonds shift focus from project-level to entity-level performance commitments

Compliance Markets

- Mandatory cap-and-trade systems
- EU ETS: 700+ billion EUR market
- California cap-and-trade
- China national ETS
- Price: 80-100 EUR/ton (EU ETS 2024)

EU ETS Details

- Covers 40% of EU GHG emissions
- 10,000+ installations
- Cap declining 2.2% per year

Voluntary Carbon Markets

- Corporate offsetting
- Project-based credits (VCS, Gold Standard)
- Nature-based solutions popular
- Price: 5-50 USD/ton (high variance)
- Market size: 2 billion USD (2024)

Key Challenges

- Additionality verification
- Permanence concerns
- Double-counting risks
- Integrity of offset projects

Carbon markets provide price signals for emissions reductions but face credibility and quality challenges

Financial Fundamentals Review

Core Concepts

- Present Value (PV)
- Future Value (FV)
- Discount rate (r)
- Number of periods (n)

Formulas

$$PV = \frac{FV}{(1 + r)^n}$$

$$NPV = \sum_{t=0}^n \frac{CF_t}{(1 + r)^t}$$

Application to Green Finance

- Long-term cash flows (renewable projects)
- Appropriate discount rates critical
- Climate risk adjusts discount rates
- Carbon pricing impacts future cash flows

Green Finance Considerations

- Should environmental benefits be valued?
- Social discount rate debate
- Intergenerational equity
- Risk-free rate + climate premium?

Time value of money principles apply to green finance but require adjustment for long horizons and climate uncertainty

Bond Price Formula

$$P = \sum_{t=1}^n \frac{C}{(1+y)^t} + \frac{F}{(1+y)^n}$$

Where:

- P = Price
- C = Coupon payment
- y = Yield to maturity
- F = Face value

Yield Measures

- Yield to maturity (YTM)
- Spread over benchmark

Green Bond Pricing

- Same credit risk as issuer
- Potential greenium: -2 to -5 bps
- Demand-driven oversubscription
- Liquidity considerations

Price Sensitivity

- Duration: sensitivity to yield changes
- Green bonds: often longer maturity
- Convexity: price-yield curvature
- Credit spread: issuer risk

Green bonds price similarly to conventional bonds but exhibit small yield discount (greenium) due to excess demand

Key Concepts

- Expected return: $E(R_p) = \sum w_i E(R_i)$
- Portfolio risk (variance)
- Diversification benefit
- Efficient frontier
- CAPM framework

Risk Measures

- Standard deviation (volatility)
- Beta (systematic risk)
- Sharpe ratio: $(R_p - R_f)/\sigma_p$

Green Portfolio Considerations

- ESG factors as risk factors
- Climate risk as systematic risk
- Green assets: diversification benefits
- Sector tilts: renewable energy, tech

Empirical Evidence

- Similar Sharpe ratios to conventional
- Lower tail risk in some studies
- Resilience during crises
- Long-term outperformance potential

Modern portfolio theory applies to green finance with climate risk as additional systematic factor requiring integration

Core Concepts

- Green finance mobilizes capital for environmental outcomes
- Market size: 5+ trillion USD annually
- Growth driven by climate urgency and regulation
- Diverse ecosystem of participants

Key Instruments

- Green bonds: 1.6 trillion USD market
- Sustainability-linked bonds
- Carbon markets

Financial Fundamentals

- Time value of money applies with adjustments
- Green bonds price with small greenium
- Portfolio theory + climate risk integration
- No return sacrifice for green investing

Looking Ahead

- Week 2: Deep dive into green bonds
- Week 3: ESG integration and analytics
- Week 4: Climate risk assessment (TCFD)

Green finance is financially sound, rapidly growing, and essential for climate transition with significant business opportunities

Week 1 Complete

Next: Week 2 - Green Bonds and Sustainable Debt Instruments

Reading assignments distributed — Prepare Excel for workshops