

FORM FOLLOWS FUNCTION: DESIGNING CLIMATE POLICIES LIKE POLYMERS

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BACKGROUND

“Form follows function,” a design principle originating from architect Louis Sullivan, suggests that systems should take shape according to their purpose. While interpretations of this dictum vary across disciplines, it remains a strong foundation for intentional design. In materials science, form and function are inseparable, as minuscule structures ultimately determine performance.

WHAT ARE POLYMERS?

Polymers are molecular structures made of repeating singular units called **monomers**, which are linked by **bonds** that vary in strength and stability. These structures are foundational to many materials, from textiles and plastics, to organic substances like carbohydrates and proteins.

WHAT IF WE REIMAGINE POLICIES AS POLYMERS?

Just as in materials, the strength and type of bonds within policies and agreements affect their performance and longevity. In this analogy, nations, institutions, agencies, and communities act as monomers, connected through shared commitments, targets, and regulatory mechanisms.

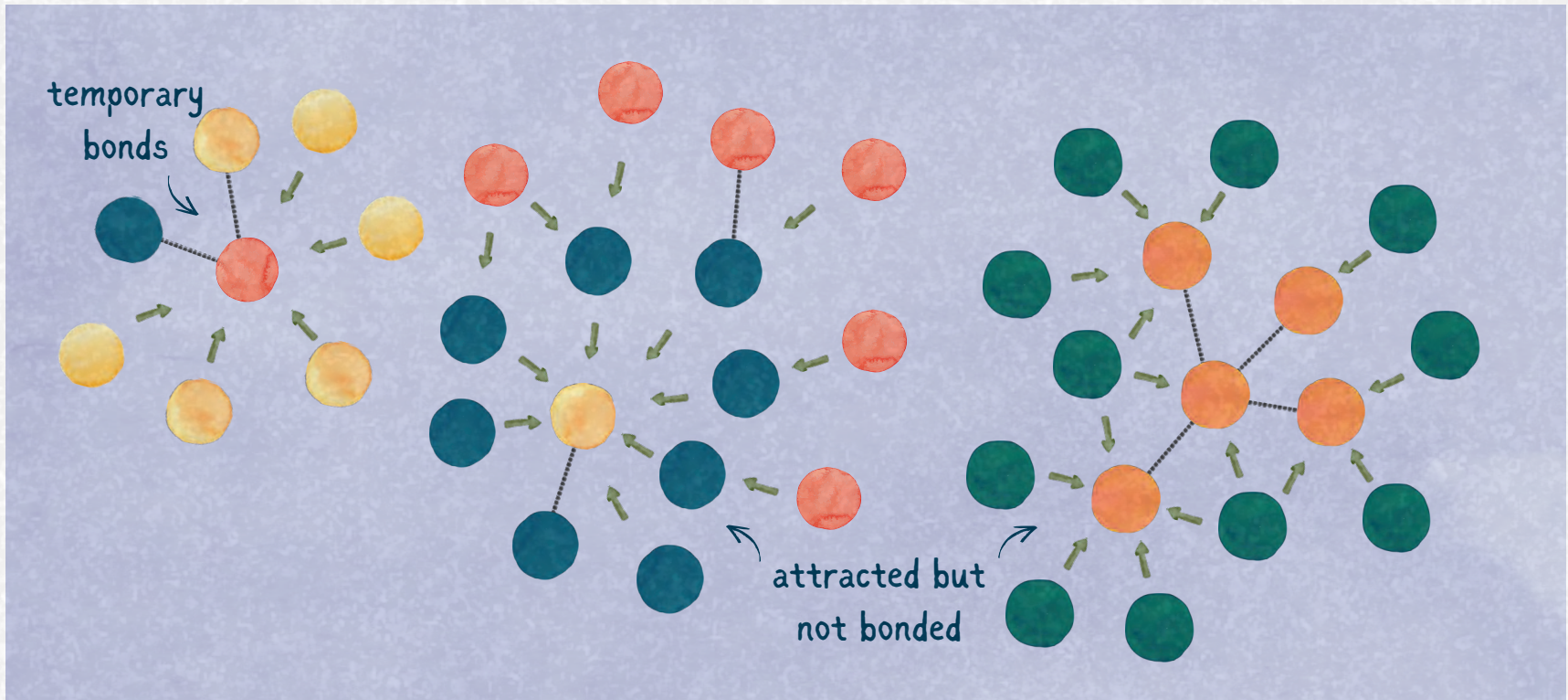
Bond type	Description	Relative Strength	Policy Analogy
Covalent	strong chemical bond formed by electron sharing between atoms (e.g., plastics)	high	Legally binding clauses
Ionic	electrostatic attraction, can be strong but brittle	moderate	Conditional support (e.g., climate finance)
Hydrogen	intermolecular force of attraction, weaker, flexible bonds	low	Voluntary cooperation, soft commitments
Van der Waals	very weak intermolecular force of attraction	very low	Informal networks, goodwill

Extending this concept, we propose a novel metaphor that reimagines global climate governance by treating policy frameworks as polymer structures. Like materials, these systems could be intentionally designed to serve both our people and our planet. Just as a polymer’s strength depends on its bonds, the durability of climate agreements relies on how nations connect and share responsibilities.



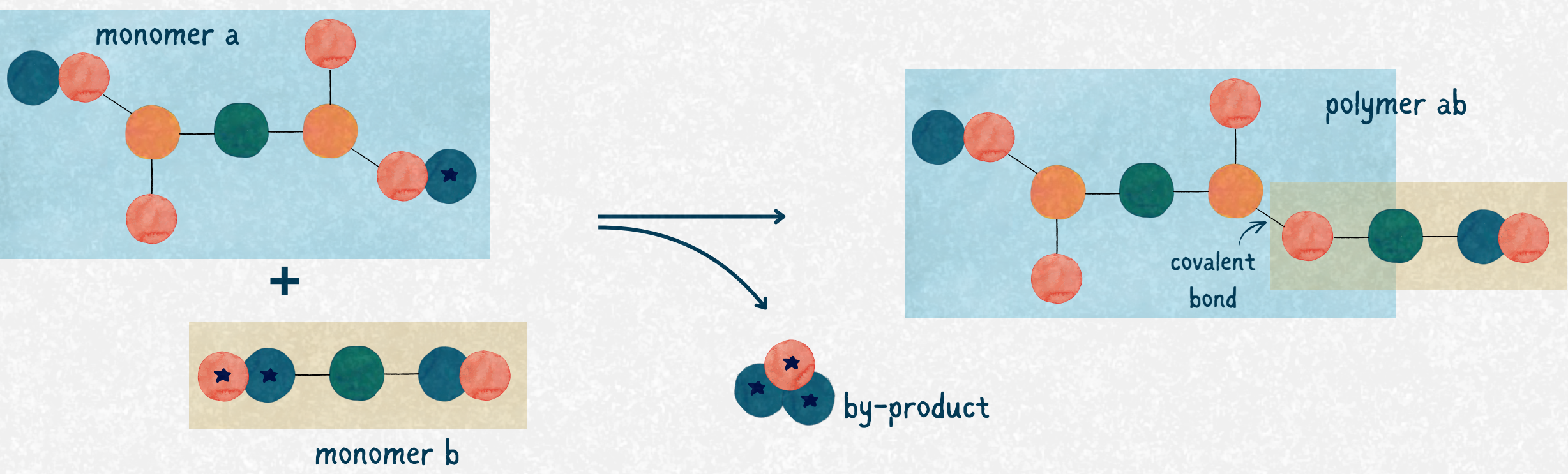
LAYING THE GROUNDWORK FOR CONNECTION

Early-stage systems can resemble *pre-polymerized resin*, with short chains, some early links but lacking strong, lasting bonds. The **Copenhagen Accord** reflected this form. It introduced key concepts like the 2°C target and voluntary pledges, but without binding structure or enforcement. These loose bonds, while fragile, helped surface shared goals and laid the groundwork for more cohesive frameworks like the Paris Agreement.

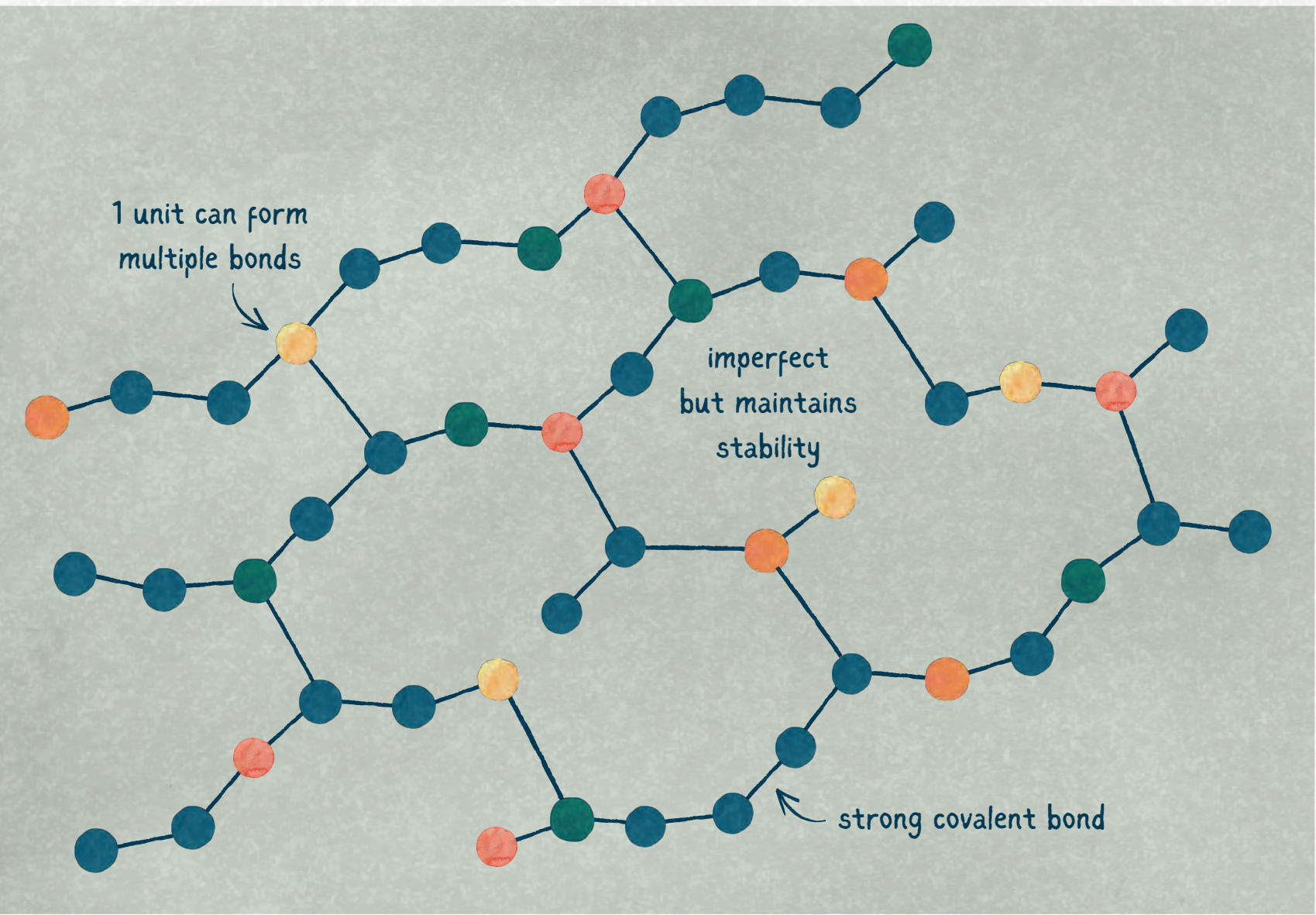


BUILDING STRONG, INTERCONNECTED SYSTEMS

Step-growth polymerization offers a useful way to think about how systems form through gradual, mutual connections. In this process, individual units bond over time, often releasing a by-product with each link. This release symbolizes the trade-offs involved in building cohesive structures. Though the process begins slowly, the network strengthens as more bonds form, resulting in a more stable system.



The **2015 Paris Agreement** could be viewed through this lens. Nations and their Nationally Determined Contributions (NDCs) may be seen as monomers and functional groups. These diverse units have the potential to connect in different ways. Each bond might represent a negotiated compromise that contributes to a more unified and stable whole.



DESIGNING POLICIES FOR RESILIENT FUTURES

Viewing climate agreements as polymers unlocks a design-oriented approach for crafting more resilient and adaptive policies. This perspective encourages collaboration with polymer scientists to develop more sophisticated models that reflect structural dynamics of real-world systems. Policy labs and institutions can prototype “lab-scale policies” to simulate complex interactions, anticipate breaking points, and strengthen cohesion and long-term durability. This experimental approach can complement traditional policy checkpoints.

This framework invites policy designers, urban planners, and institutional actors to engage in interactive and hands-on processes: to design, prototype, and refine the bonds that will shape a climate-secure future for all.

References:
[1] Sullivan, Louis. “The Tall Office Building Artistically Considered,” Lippincott’s Magazine, March 1896.
[2] Rajamani, Lavanya. “III. THE MAKING AND UNMAKING OF THE COPENHAGEN ACCORD.” International and Comparative Law Quarterly 59, no. 3 (July 1, 2010): 824–43.
[3] United Nations. “The Paris Agreement | United Nations,” n.d. <https://www.un.org/en/climatechange/paris-agreement>.