cantor's world

CURRICULUM FRAMEWORK FOR CANTOR'S WORLD

(8 one-hour modules)

About the Game

The actual decision-making involved in running a country is about finding the most efficient use of limited resources. The process of making a decision from the nearly infinite set of choices, with different combinations of inputs and outputs, makes it a nontrivial task. This is especially the case at the macro level where governments need to make decisions on investments for economic growth while ensuring high rates on return of these investments towards the Gross Domestic Product (GDP).

Traditionally, the focus of most governments has been to maximize GDP. Human well-being was understood as being synonymous with economic growth measured by income growth. And therefore, the question of sustainability was never an issue. This has, however, changed over the past few years. The increasing recognition of the finite nature of resources and the increasing attention to negative externalities accruing from economic activities has made it necessary for governments to address the sustainability dimension of economic activities. Equally important has been the recognition that just growth in income or GDP does not automatically contribute to well-being.

Hence, there is a need to make a distinction of what we want to measure. What do we mean when we say a country is growing? Can we say that a country is growing if the GDP is growing? Remember, GDP is the value of all final goods and services. So, it is a flow just as if an individual gets income at the end of every month if the person is working. Some might say that this is a good indicator to evaluate if the country is growing.

Are there other indicators that one can use?

The Inclusive Wealth Model (IWM) developed by Partha Dasgupta and Ken Arrow offer a viable substitute for GDP to measure progress. The underlying premise of the Inclusive Wealth Index (IWI) is that the real progress of a country should be not based on the flow of income produced by the stock of capital a country is able to accumulate. We could have an indicator based on the stock of assets a country owns. The focus shifts from flow to stock. So, the important factor here is not the income per se generated in each time period but the asset base or stock in each time period from which the income is generated. This also shifts the focus from the present to the future.

This raises a number of interesting questions that we must find answers if sustainability is to be also addressed:

First, if GDP is the most appropriate indicator to measure the wellbeing of society?

Second, how do we ensure the sustainability of GDP if it is agreed among policymakers that it is a good measure or proxy for wellbeing?

Third, If GDP falls short of measuring wellbeing, then can the SDG's be used as a measure of wellbeing?

Fourth, do we need resources to achieve the SDG's and if yes, what measure can we use to track the use of resources?

Fifth, can the Inclusive Wealth Index (IWI) be a useful indicator to measure and track the use of resources?

Sixth, can we achieve the SDG's while at the same time ensuring a sustainable use of resources?

To answer these questions, we have...

Cantor's World, one of the many learning products developed by UNESCO MGIEP. It is a simulation based game developed to understand the Inclusive Wealth Index, and to understand the uncertainties involved in governing a complex socio-economic system of a country. The game is targeted towards master's level students of economics and sustainability studies and mid-career policy makers. The participants play the role of the sole architect of the country and decide specific targets for their respective countries. The players then make changes to the various parameters in the game through specific policy interventions that are available as either monetary investment or regulatory change or providing subsidies.

The players' decisions affect the status of resources in the country and have a cascading effect on the produced, natural and human capital. The player's objectives in the game are both personal and global wellbeing. The facilitators of the game session are able to monitor the decisions and trajectories of the players in the game. Cantor's World is supplemented with well-defined learning outcomes including a curriculum framework with eight one-hour modules to direct the flow and usage in classroom setting.
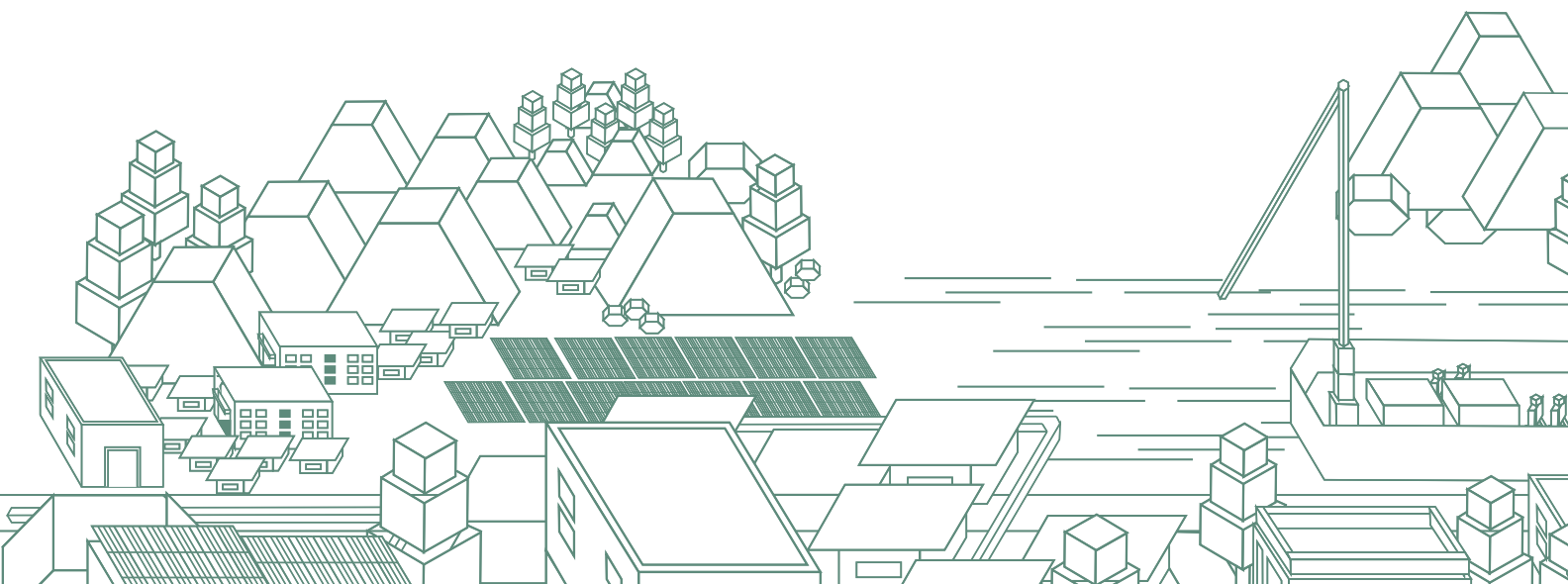
MODULE: 1

LEARNING OUTCOME

To understand the controls, dynamics and behaviour of the game and gameplay

Each student should have their log in ID and password and should be assigned a country in order to play the game. Students play an instance of the game starting in 1995. Students should focus on understanding the controls and interface of the game. The first lesson is about 60 minutes of gameplay and getting familiar with the game.

KEY POINTS	ACTIVITIES
The students need to familiarise themselves with:	Playing multiple instances of the game repeatedly to,
1. game interface and controls.	1. get a grip of the game, game screens and its components.
2. actions available to the player in the game.	2. understand the controls available, identifying in-game actions to implement policies
3. flow of the game, role of countries, state of capitals, indicators, etc.	3. identify the variables and indicators available for a particular country **(60 minutes)**

FORMATIVE ASSESSMENT

1.   What are some growth indicators available in the game?

2.   According to you, what are some key variables that define the game and are most significant to game dynamics?

3.   For your country, make a list of three variables available under each capital in the game.

THINK OVER

1.   List any 3 good points about the game. What is it that you like about the game?

2.   What is it that you would want more from such a game?

3.   What are some indicators to measure growth/ wealth of a country?

4.   What are the parameters that you would consider when examining the trueness of an indicator as the measure of a country's growth/ wealth?

MODULE: 2

LEARNING OUTCOME

To understand the relationship between national income (GDP), inclusive wealth and wellbeing.

| KEY POINTS	ACTIVITIES
1. Define national income (GDP).	1. Write the definition of GDP (from your understanding) before and after playing the game.
2. Describe the process to calculate GDP and its components.	2. Deconstruct the definition of GDP and identify the process of calculating the GDP of a country. **(10 minutes)**
3. Define Inclusive Wealth.	3. Write the definition of Inclusive Wealth from your own understanding, before and after playing the game.
4. Describe the process to calculate inclusive wealth and its components.	4. Deconstruct the definition of Inclusive Wealth and identify the process of calculating the Inclusive Wealth of a country. **(10 minutes)**
5. Compare growth/wealth indicators – GDP and Inclusive Wealth.	5. Debate/discuss the appropriateness of GDP vs Inclusive Wealth. • After playing the game, compare, contrast and distinguish between GDP and Inclusive Wealth as indicators of growth/wealth using tables, diagrams and charts. **(10 minutes)**
6. Define Wellbeing.	6. From your understanding of GDP and Inclusive Wealth, how would you define 'wellbeing'? Describe and discuss the connection among these three. **(10 minutes)**
7. Connect GDP and Inclusive Wealth with wellbeing.	Play the game, map effects of change in GDP and Inclusive Wealth on 'wellbeing', and review policies that have positively affected 'wellbeing'. Identify indicators for 'wellbeing.' **(20 minutes)**

FORMATIVE ASSESSMENT

1. What approach did you have in mind when you were trying to maximise your GDP and Inclusive Wealth? How did you choose between the policies?

2. Which in-game indicators can be used as a proxy for wellbeing? Justify your selection.

THINK OVER

1. If you were the sole architect of your country in 1995, think about
   a. What kind of policies you would implement to maximise your GDP and your Inclusive Wealth?
   b. How much would you invest in different sectors to maximise your GDP?
   c. How much would you invest in different sectors to maximise your Inclusive Wealth?
   d. In the context of your country, which capital would be your priority and why?

2. Compare, contrast and critique different definitions of wellbeing as given by any two of your favorite economists.

   After the above mentioned exercise and playing the game, how would you reframe your definition of wellbeing?

3. Does improving GDP and/or Inclusive Wealth directly imply an improvement in wellbeing? Write a blog article on policy formulation to improve wellbeing and the significance of indicators like the GDP, Inclusive Wealth, HDI, etc.
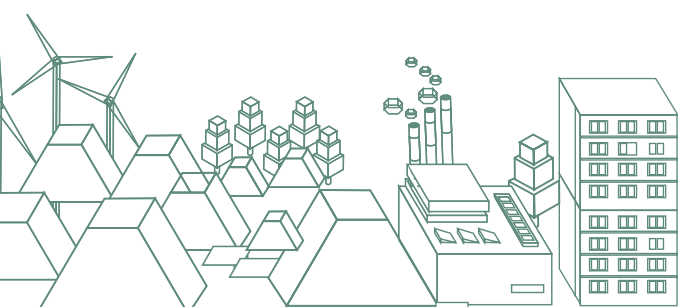
MODULE: 3

LEARNING OUTCOME
To understand the relationship between productive base of the economy and Inclusive Wealth.
Students move between playing the game and discussions, non-game exercises and writing down their observations.

KEY POINTS	ACTIVITIES
1. Implement policies with an objective to maximise GDP and Inclusive Wealth.	1. Start playing the game from year 1995, implementing policies in the game with the objective to maximise GDP and Inclusive Wealth. **(10 minutes)**
2. Summarise observations made when trying to achieve the objectives stated above.	2. List reasons for any three key observations made while trying to maximise GDP and Inclusive Wealth. Some contexts to use: i. Capitals affected ii. Variables affected iii. Is it possible to implement the policies in such a way that both GDP and Inclusive Wealth rise, or is there a scenario of conflict between the two? **(10 minutes)**
3. Define productive base.	3. List components of the productive base. • Identify variables which could impact the natural, produced and human capital. **(5 minutes)**
4. Observe the impact of investment on capitals and Inclusive Wealth (within country).	4. i. Play the game to observe the impact of • policy implementation on the variables affecting the three capitals • policy implementation on the three capitals and the Inclusive Wealth ii. Discuss your observations. **(25 minutes)**
5. Observe the impact of investment on capitals on Inclusive Wealth (across countries).	5. Debate/discuss the appropriateness of GDP vs Inclusive Wealth i. Play the game, implementing policies keeping in the mind the capitals to impact and invest on, observing the impact of investments made on certain capitals on Inclusive Wealth. ii. Discuss in class the trend within a single country and across countries. **(10 minutes)**

FORMATIVE ASSESSMENT

1. For the years 2001-2004 during gameplay, recommend at least one more policy for each year, that you would have implemented in your country in order to maximise GDP and Inclusive Wealth. Why do you think this policy would work? Define the capital, sectors and game variables which this policy will influence?

2. What conclusions, if any, can you draw about policy implementation which leads to change in productive base and its impact on Inclusive Wealth for your country. Can you generalise a trend for your country? Do you think a single trend would hold true for all countries? Give reasons.

3. Will the trend of affecting Inclusive Wealth by investing in certain capitals be uniform across countries?

THINK OVER

1. For your country, identify policies which
   a. impact only one variable across a single capital.
   b. impact multiple variables across a single capital.
   c. impact variables across capitals.

PROJECT

After the end of Module 3, collaborate with another student who has been playing as another country. Discuss and make a descriptive list of observations and conclusions which
a. are true for both your countries
b. are not true for both your countries

Consider the following parameters while listing:

a. Impact of implementation of policies on the GDP
b. Impact of implementation of policies on Inclusive Wealth
c. Relationships between the productive base and Inclusive Wealth

What might be the reasons for similarities/differences in trends observed?

Present your observations in class.

MODULE: 4

LEARNING OUTCOME

To understand the trade-offs between investment across assets of the productive base.

KEY POINTS	ACTIVITIES
1. Understand stock and flow variables.	1. Play the game and identify variables in the game associated with different capitals. Classify the variables as stock or flow. **(30 minutes)**
2. Make investment to influence variables.	2. Discuss and map investment decisions to change in stocks and flow variables. Identify policies to impact specific capitals and variables under them and vice-versa. **(15 minutes)**
3. Observe trade-offs across assets.	3. Play the game with an objective to optimise multiple variables at the same time. Identify and implement policies to improve overall productive base. **(15 minutes)**

FORMATIVE ASSESSMENT

1. For your country, frame a new policy such that investing in its implementation will affect

   a. stock variable associated with a capital

   b. flow variable associated with a capital

   Mention the variable and capital it affects and how.

THINK OVER

1. If you were allowed to reframe the game, how will you design your policies so as to optimise the values of your overall productive base, across three capitals. Choose a three-year period from the game and design your own policies for that period. Map the policies to associated capitals and variables and mention in detail how each one is affected.

MODULE: 5

LEARNING OUTCOME

To understand intertemporal aspects of investments across assets.

KEY POINTS	ACTIVITIES
1. Tracking values of assets within and across capitals over time.	1. Play multiple instances of the game, investing on certain assets and tracking their values • within capitals • across capitals by investing in them over time. (30 minutes
2. Identifying trends of investments on assets over time.	2. Represent trends/behaviour of assets over time using graphs and charts. Write your observations from these graphs. (15 minutes)
	3. Prepare • strategies for investments and • policies to ensure sustainability of assets. (15 minutes)

FORMATIVE ASSESSMENT

1. Will all assets behave in a similar fashion when similar investments are made in them over time?

THINK OVER

1. Will the trend of change in Inclusive Wealth by investing in certain capitals be uniform in your country over time?

2. Will the trend of change in Inclusive Wealth by investing in certain capitals be uniform across countries over time?

PROJECT

Collaborate with the same group/student you collaborated for the previous project. Assuming the current year to be 2011, frame at least one new policy for both countries.

Discuss

a. The rationale behind introducing this policy in that particular country.

b. The type of each policy.

c. The capitals each policy impacts.

d. The variables/assets each policy impacts.

e. The impact of each policy on the GDP.

f. The impact of each policy on Inclusive Wealth.

g. The impact of each policy on Wellbeing.

h. Present your project in class.

MODULE: 6

LEARNING OUTCOME

To understand intertemporal aspects of investments across assets.

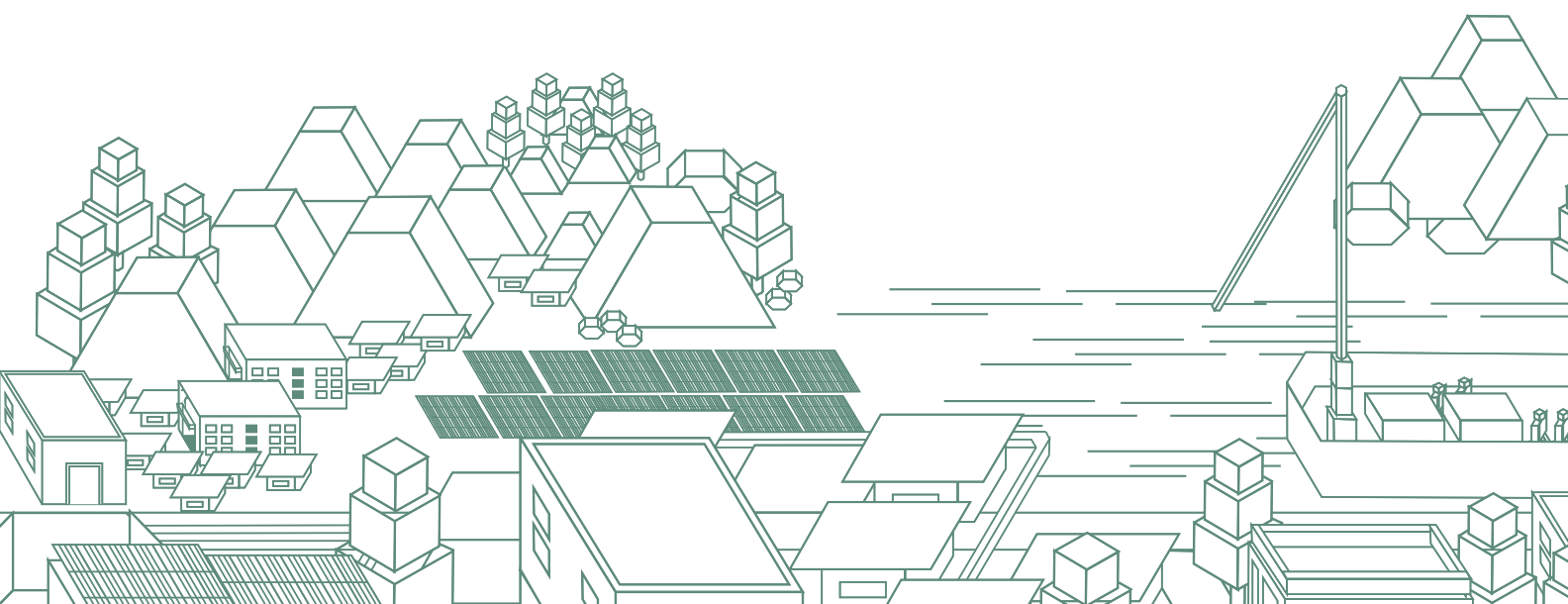| KEY POINTS	ACTIVITIES
1. Tracking values of indicators over time.	1. Play the game to track values of indicators (GDP and Inclusive Wealth) with investments in appropriate assets over time. **(20 minutes)**
2. Identifying trends of indicators over time.	2. Compare trends/behaviour of indicators as a result of investing in specific assets over time, across countries. **(20 minutes)**
	3. Prepare, discuss and compare investment strategies over time to achieve objectives like maximising GDP, Inclusive Wealth, a particular asset or variable across countries. **(20 minutes)**

FORMATIVE ASSESSMENT

1. For your country, which asset(s) would you continuously invest in, in order to maximise your GDP over a long period of time?

2. For your country, which asset(s) would you continuously invest in, in order to maximise your Inclusive Wealth over a long period of time?

3. Will the trend of investing in a particular asset over time to maximise GDP and/or Inclusive Wealth be similar for all countries or a group of countries?

THINK OVER

1. Does ensuring continuous maximisation of GDP and/or Inclusive Wealth also ensure wellbeing over time?

2. For your country, define and map investment strategies on the basis of time periods with an objective of maximising GDP, Inclusive Wealth and 'wellbeing'. List down policies to implement and assets to invest in for achieving these outcomes.

3. Write down your key observations about
   a. The time at which the investment was made in different capitals.
   b. Impact of investment on certain capitals at different points in time.

MODULE: 7

LEARNING OUTCOME

To understand the implications of change in wealth on attaining the SDGs.

KEY POINTS	ACTIVITIES
1. Identifying variables/assets associated with three in-game SDGs.	1. Play the game, identifying policies which impact the SDGs, identifying and listing variables/assets linked with the SDGs. **(20 minutes)**
2. Attaining the SDGs.	2. Play the game, with an objective to attain all three in-game SDGs for the playing country at least for one year. **(20 minutes)**
3. Assessing the impact on wealth.	3. Observe and discuss impact on indicators like the GDP and Inclusive Wealth while trying to attain the SDGs. **(20 minutes)**

FORMATIVE ASSESSMENT

1. Which in-game SDG did you give the highest and the lowest priority to? Give reasons for your selection and justify the selection in the context of your country.

2. Were you able to attain all three SDGs for your country?

THINK OVER

1. For each year for your country, and against each in-game policy that is available to you, identify whether it has an impact on any SDG or not? If yes, also mention the SDG it affects and how.

2. Write a blog article on the implications of attaining SDGs on your country. Discuss if attaining the SDGs is even possible and if yes, what it would mean for your country's wealth and wellbeing.

MODULE: 8

LEARNING OUTCOME

To understand the implications of change in wealth on attaining the SDGs.

KEY POINTS	ACTIVITIES
1. Sustainability of the SDGs.	1. Play the game for multiple instances with an objective to ensure that all three SDGs are attained for a sustained period of time. **(20 minutes)**
2. Incorporating other SDGs.	2. Discuss in class, the observations made while trying to attain the SDGs. List observations and identify reasons for them. **(10 minutes)**
	3. Play the game to identify and map in-game policies with SDGs other than the ones given in the game. **(20 minutes)**
	4. Ascertain which SDGs can be mapped to existing policies in a particular country. **(10 minutes)**

FORMATIVE ASSESSMENT

1. Which one of the three in-game SDGs was the easiest for your country to achieve?

2. Were you able to ensure the sustainability of the SDGs for your country?

THINK OVER

If the game was to go beyond 2010, frame at least 5 policies for your country with an objective of achieving the SDGs.

PROJECT

Collaborate with the same group/students you collaborated with in the previous project.

For both your countries, discuss and prepare a descriptive comparison on the following ideas:

a. Behaviour of the following with respect to time:
   1. variables/assets
   2. capitals
   3. growth indicators
   4. wellbeing indicators

b. Add more (other) SDGs in the game, create new policies for your countries and map them to these SDGs, explain your reasons for making these choices. Also list the variables/assets affected by these policies.

c. Were you able to achieve the SDGs and have a non-decreasing Inclusive Wealth Index (IWI) at the same time? How possible in the real world do you think achieving such a scenario is?

d. Present your comparative study in class discussing as many interesting conclusions and observations you made about
   i. trends
   ii. attaining the SDGs
   iii. investment decisions
   iv. maximising indicators like GDP and Inclusive Wealth
   v. wellbeing

RESOURCES AND EXTENDED READINGS

1. Inclusive Wealth Report 2012, Measuring progress toward sustainability

    UNU-IHDP, UNEP

2. Inclusive Wealth Report 2014, Measuring progress toward sustainability

    UNU-IHDP, UNEP

3. Inclusive Wealth Report 2012, Measuring progress toward sustainability, **SUMMARY FOR DECISION MAKERS**

    UNU-IHDP, UNEP

4. Are We Consuming Too Much?
    Kenneth Arrow, Partha Dasgupta, Lawrence Goulder, Gretchen Daily, Paul Ehrlich, Geoffrey Heal, Simon Levin, Karl-Goran Maler, Stephen Schneider, David Starrett and Brian Walker
    Journal of Economic Perspectives—Volume 18, Number 3— Summer 2004—Pages 147-172

5. Where is the wealth of nations? - Measuring Capital for the 21st Century

    The World Bank, 2006
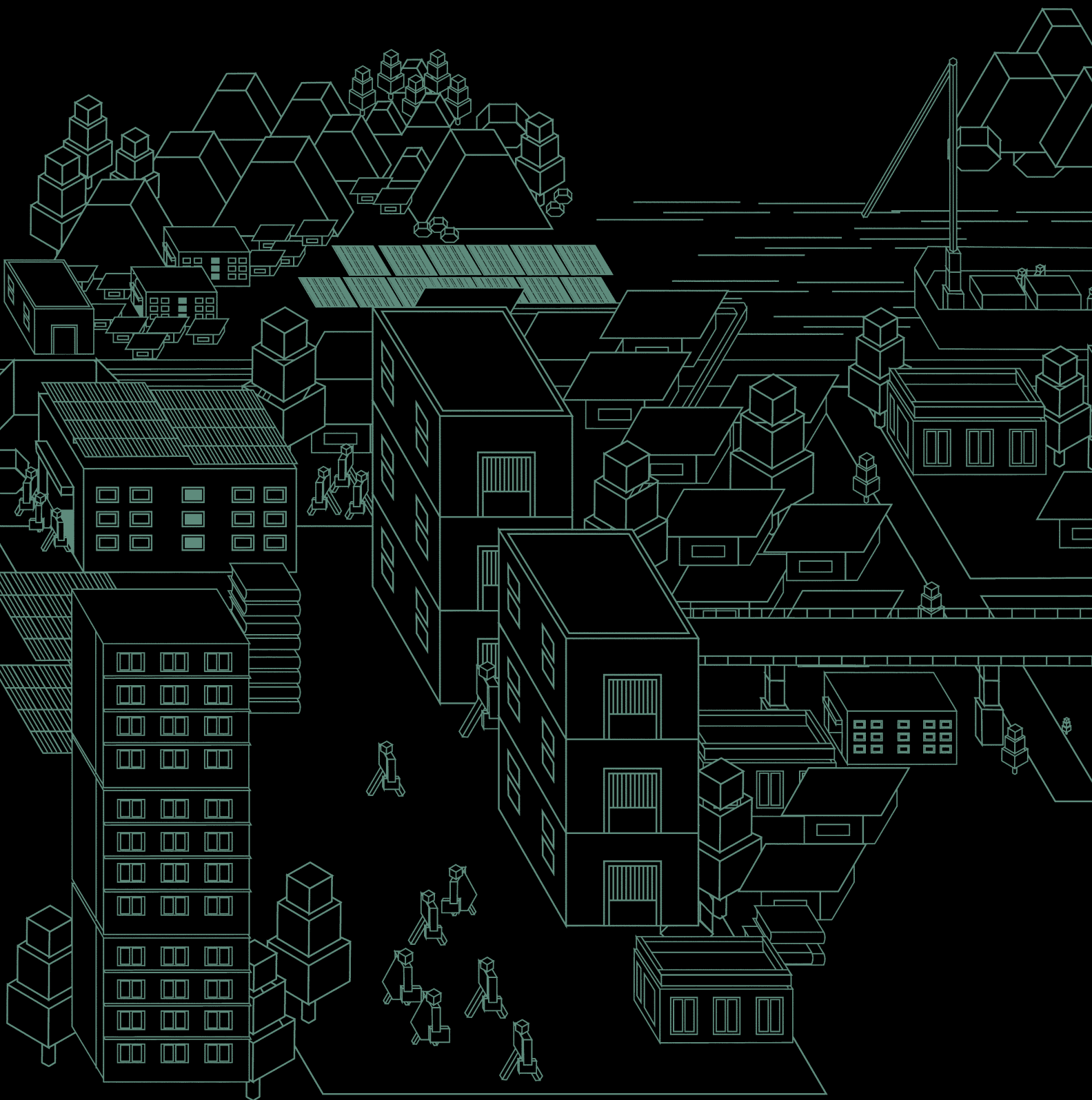
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