WELCOME TO EXOPLANET 1061!
The game where you BUILD and DESIGN to SURVIVE.

In the year 2182, environmental degradation has taken its toll on Earth. Those who have managed to survive years of famine, drought and disease rally around an eccentric leader with plans to leave Earth and colonize a lush planet five light years away. Your team is among those who join the armada and flee Earth in search of a new home.

During the journey, disaster strikes your ship, and you are forced down onto a strange alien world, known as Exoplanet 1061. While this planet is Earth-like in many respects, it does not have any fossil fuels.

The planet appears hospitable. However, soon after you crash land, your team's scientists discover it is merely a matter of time before one of the planet's two suns goes supernova. Your team needs to survive to repair the ship, conduct research, and develop a means to produce rocket fuel so you can escape Exoplanet 1061 before it is too late.

Objective:

The object of this game is to build a society where you maintain enough food, water, and energy to grow your population and advance your technologies. While doing all this, you must also manage your waste buildup and survive the natural disasters and other chance events that may befall your community.

Resources are spread out among a grid of cards you set up at the start of the game. You place buildings, upgrade technologies and collect resources on a turn-by-turn basis. To survive and win the game, you need to make sure you maintain sufficient levels of food, water and energy and not build up your waste. The ultimate goal is to advance the biofuel technology and develop rocket fuel so you can leave the planet before it explodes.

Number of Players: 3 – 8
Age Range: 12+
Time: 45 min – 1.5 hours

Table of Contents

Game Contents

- **Habitat Cards** (30)
- **Happening Cards** (30)
- **Resource Cards** (18 each type: water, food, energy, wood, ore, solid waste, liquid waste)
- **Research Credit Cards** (6)
- **Building cubes** (7 each color: white, blue, pink, orange, green, brown, red, black, yellow)
- **Waste Pile Tracking Sheet** (1)
- **Tabulation Board** (1)
- **Technology Map** (3; 1 large color, 2 smaller b/w)
- **Dice** (2)
- **Rocket** (1)

GAME SETUP

Step 1: Assign Player Roles

Assign each of the roles below to one player on the team. (Note: If there are less than six team members, the same player can fill multiple roles. Easy roles to combine are Sanitation Specialist and Chance Operator.)

Admiral: This player's role is similar to a banker. The Admiral oversees the resources on Exoplanet 1061. The Admiral hands out and withdraws the Resource Cards and Research Credits as needed during game play.

Chief of Operations: This player manages the Tabulation Board. The Chief of Operations must keep track of all the operational scores associated with the buildings and technologies your team acquires during the game. (See *Calculating Operation Scores*.)

Engineering Officer: This player manages the building cubes. After the team purchases a new building, the Engineering Officer places an appropriately colored cube on the Habitat Card selected for the building. This player also keeps track of the advancing technologies.

Sanitation Specialist: This player oversees the Waste Pile Tracking Sheet. The Sanitation Specialist keeps track of the waste buildup and warns the team if it is approaching dangerous levels. (Note: If your team collects over 15 waste cards, you lose. See *Managing Wastes*.)

Chance Operator: This player oversees the Happening Cards. At the end of each turn, the Chance Operator draws a Happening Card, reads it aloud, then rolls the dice to determine the destiny of the team.

Resource Guardian: This player manages the team's resources (except for the wastes). The Resource Guardian organizes, collects, and pays out the Resource Cards and Research Credits the team earns throughout the game to the Admiral.

Ship's Scribe (optional): This player keeps a ship's log. The Scribe records which critical decisions were keys to winning or losing the game.

Merchant Marine (optional): This player makes trades between teams. During defined trading periods, the Merchant Marines contact other teams and try to trade resources.

Step 2: Hand Out Resources and Research Credits

The Admiral sorts the Resource Cards and Research Credits into piles. The Admiral then hands out the following cards to the Resource Guardian:

- 5 Energy Resource Cards
- 5 Food Resource Cards
- 5 Water Resource Cards
- 10 Wood Resource Cards
- 10 Ore Resource Cards
- 2 Research Credit

Step 3: Set Up Habitat and Happening Cards

The Sanitation Specialist shuffles the Habitat Cards, and then lays them face down in a board shape that is five columns wide by six rows high. These cards have resource values between 1 and 5.

Habitat Card

The Chance Operator shuffles the Happening Cards and places them face down in a pile.

Step 4: Organize Building Cubes

The Engineering Officer sorts all the Building Cubes by color. Refer to the Technology Map to see which tech category each color represents. (See *Reading the Technology Map*.)

Step 5: Hand out Tabulation Board, Waste Pile Tracking Sheet, and Technology Maps

The Chief of Operations receives the Tabulation Board and places all the paper clip markers at '0'.

The Sanitation Specialist receives the Waste Pile Tracking Sheet.

Distribute the large Technology Map to the Engineering Officer and the smaller versions of the Technology Maps to the rest of the team for reference.

Step 6: Place Initial Colony

As a team, select a Habitat Card where you want to place your first colony and flip the card over. The Engineering Officer then puts a white cube on this card to mark it as a colony. You may not access any of the resources on cards with a colony.

> ### Helpful Hint:
> Placing your initial colony near the center of the cards helps you uncover more cards in fewer turns.

The Chief of Operations refers to the Technology Map and then records the operation score on the Tabulation Board. **Note:** Only tabulate the operation score. (See *Reading the Technology Map* and *Tabulating Operation Scores*.)

Once you place the colony, turn over the cards directly adjacent to it. This includes any cards touching the top, bottom, right or left of the colony card. It does NOT include diagonally touching cards.

Step 7: Place Other Buildings

Work as a team place the other buildings in your colony. You may build or upgrade up to three buildings per turn. These buildings are built on Habitat Cards that are revealed during game play and show a corresponding resource.

For example, you can only place farms on cards with a Food resource. Similarly, you can only place a well on a Habitat Cards with water resources, and you can only place electrical power plants on cards with an energy resource.

Lay Habitat Cards face down, five across and six down. Turn one card over. This will be your initial colony. Place white cube to mark it as a colony.

Turn over adjacent cards to the top, bottom, left and right. Do this **every time** you place a building. This opens up the board. The resource values on the cards are between 1-5. Begin placing the other buildings.

In the example shown left, cards with higher resource values opened up as each new building was placed and adjacent cards were flipped over.

The Engineering Officer places a colored cube on the Habitat Card the team has chosen to mark the locations of your farm (pink), well (blue), and electrical power plant (orange), mine (brown), mill (green) and biofuels plant (red).

The resource score shown on the Habitat Card indicates what "+Card Score" to add to the tabulation board. While most Habitat Cards show two resources, you can only build on one of them. Choose wisely, and only record the resource scores of the one you choose on the Tabulation Board.

Place one building at a time. After placing a building, immediately turn over the adjacent cards to reveal more resources before moving on to placing the next building.

For each building placed, the Chief of Operations then refers to the Technology Map and adds the operation score of the building to the Tabulation Board.

GENERAL GAME PLAY

After the initial colony is set up, each turn proceeds in three parts. You MUST perform the steps in the order listed below.

Step 1: Resource Allocation and Collection
The Admiral dispenses Resource Cards from the Resource Bank, or collects them from the Resource Guardian, based on the Tabulation Board scores. The Sanitation Engineer receives any waste resource cards (solid waste and liquid waste) and places them on the Waste Pile Tracking Sheet.

Note: If there is a negative score associated with any resources, the Admiral collects those resources or waste cards from the Resource Guardian or Sanitation Engineer, and places them back into the Resource Bank. (See *Managing Wastes*.)

Step 2: Construction and Research
During this portion of the turn, you can purchase/place up to three buildings or technology upgrades per turn. You can also purchase up to two Research Credits per turn.

To add a building or upgrade a technology refer to the building costs listed on the Technology Map. The Resource Guardian pays the building costs to the Admiral, and then the Engineering Officer places a building cube on the Habitat Card that the team chooses. After adding each building, the Chief of Operations refers to the Technology Map and adds the building's operation score to the Tabulation Board. Remember, after placing a building, flip over any adjacent cards to reveal more resource cards.

UNLOCKING LEVELS: Upgrades must proceed sequentially; you must have bought and placed a Base Technology prior to buying and placing its Advance Technology upgrade. Advanced Technology upgrades must be bought and placed prior to adding Interstellar Technology upgrades.

To unlock building upgrades, you MUST first have purchased and placed the required number of colonies required for each level. (See *Reading the Technology Map* and *Unlocking Upgrades*.)

Once a level is unlocked, you can then purchase technology upgrades for your buildings in that level. To purchase an upgrade the Resource Guardian must pay the upgrade cost to the Admiral. The Engineering Officer then places another cube on the card that contains the upgraded building. The Chief of Operations refers to the Technology Map and adds the operations score to the Tabulation Board.

> **Helpful Hint:** Use Research Credits to upgrade technologies. Each Research Credit costs two food resource cards, two energy resource cards, and two water resource cards. Purchase them from the Admiral.

Step 3: Happening Cards

Lastly, the Chance Operator draws a single Happening Card from the top of the pile and reads it aloud. The Chance Operator then rolls the dice and follows the directions as indicated on the card.

Repeat steps one through three for each turn until you win or lose the game.

Helpful Hint: Depending on the roll of the dice, Happening Cards can result in your team losing or gaining up to three Resource Cards or losing or gaining up to two Research Credit. Wastes may also be added to or removed from the waste pile.

Winning (or Losing) the Game:

To win the game you must advance to the Interstellar Technology level and upgrade your biofuels plant so it can produce Rocket Fuel. Place the rocket figurine on the Habitat Cards to symbolize victory and your team's escape from Exoplanet 1061.

Remember! Once you place the rocket, you still must draw your final Happening Card. So, make sure there are spare resources available in case of a negative outcome.

Your team can lose the game in two ways. You lose if at any point, you run out (run negative on) energy, food, or water resource cards. You can also lose if your waste pile overflows. Collect more than 15 combined solid and liquid waste resource cards, and you lose.

Zombie Attack

Zombies are on the loose!

Roll an even number and the zombies turn out to be friendly and help you find water. Gain 3 water.

Otherwise, they cause massive damage before they are stopped. Lose 1 energy, 1 food and 1 water.

Depending on the roll of the dice, Happening Cards can have both good and bad outcomes.

Winning the game by getting to Level Four and making rocket fuel.

GAME PLAY ALMANAC

Reading the Technology Map: This map is a guide to help you purchase buildings and technologies, advance to new levels and keep track of the building costs and technologies operation scores.

Each horizontal column in the Technology Map refers to a specific technology category. The technology's color is listed at the top and corresponds to the building block color.

At the start of the game, after you build your first colony, you have access to Base Technologies and Advanced Technologies.

The **Building Cost** on the map is indicated with a hard hat symbol. It lists the resources you need to purchase a building or technology upgrade. Pay the building cost to the Admiral, receive a building cube and place it on the Habitat Card the team selects.

The **Operation Score**, indicated with an abacus symbol, shows the amount of resources needed for each building or technology. Record these scores on the Tabulation Board.

There is a **+Card Score** for water, food, energy, wood and ore categories. These scores tie directly to the resource value listed on the Habitat Cards. Add this card value to the Tabulation Board. For example, if you build a mine on a Habitat Card that has an Ore 4 value, you would add four ore to the Tabulation Board.

SHELTER
- COLOR White — Colony — 2 wood, 2 ore / −2 energy, −2 food, −2 water, +1 liquid waste, +1 solid waste
- Smart Grid Technology — 1 ore, 1 research credit / +1 energy, +1 food, +1 water

YOUR MISSION: Advance your technologies and develop rocket fuel so you can survive and leave Exoplanet 1061.

WATER (COLOR Blue)
- Well — 1 wood, 1 ore / −1 energy, + Card Score (water)
- Desalination Plant — 1 ore, 1 research credit / −2 energy + Card Score again (water)
- Air Condensation Plant — 1 ore, 2 research credits / +2 energy + Card Score again (water)

KNOW YOUR BUILDING LIMITS! You can build NO MORE than 2 buildings for any of the categories. Each building can be upgraded to a higher tech level.

FOOD (COLOR pink)
- Farm — 1 wood, 1 ore / −1 energy, −2 water, +1 solid waste + Card Score (food)
- Genetically Modified Crops — 1 wood, 1 research credit / + Card Score again (food)
- Spirulina (algae) Farm — 1 wood, 1 ore, 2 research credits / +2 water, −2 liquid waste +2 food

ENERGY (COLOR orange)
- Photovoltaic Solar Energy — 2 wood, 2 ore / + Card Score (energy)
- Concentrated Solar Energy — 1 ore, 1 research credit / + Add Card Score again (energy)

TECH MAP KEY
- Cost to construct initial buildings or upgrade technology
- Operations score to add to the Tabulation Board
- Base Technology
- Advanced Technology
- Interstellar Technology

Number of Colonies need to advance technologies:
- 1 colony to start building Base Technologies and upgrade to Advanced Technologies
- 2 colonies to build Interstellar Technologies

FORESTRY (COLOR green)
- Lumber Mill — 2 wood, 2 ore / −1 energy, + Card Score (wood)
- Advanced Forestry Mill — 1 wood, 1 research credit / + Add Card Score again (wood)

MINING (COLOR brown)
- Mine — 2 wood, 2 ore / −1 energy, +1 liquid waste, + Card Score (ore)
- Advanced Mine — 1 wood, 1 ore, 1 research credit / + Add Card Score again (ore)

BIOFUELS (COLOR red)
- Biodiesel — 1 wood, 1 ore / + 2 energy, −2 food, +1 liquid waste
- Cellulosic Ethanol — 1 wood, 1 ore, 1 research credit / +2 food, −2 wood, +1 liquid waste
- Yeast-based Hydro-Carbons — 1 ore, 2 research credits / +1 energy, +2 wood, −2 liquid waste
- ROCKET FUEL! VICTORY! — 2 wood, 2 ore, 3 research credits

SOLID WASTE (COLOR black)
- Landfill — 1 wood, 1 ore / −1 energy, −2 solid waste
- Incineration Plant — 1 wood, 1 ore, 1 research credit / +2 energy, −1 solid waste
- Gasification Plant — 1 wood, 1 ore, 2 research credits / +2 energy −2 solid waste

WHAT DO RESEARCH CREDIT COSTS?
- 1 Food
- 1 Water
- 1 Energy

You can purchase research credits from the Admiral at the beginning of each turn.

LIQUID WASTE (COLOR yellow)
- Wastewater Treatment (aerobic) — 2 wood, 2 ore / −2 energy, −2 liquid waste
- Anaerobic Digester — 1 ore, 1 research credit / +1 energy −2 liquid waste
- Microbial Fuel Cell — 1 ore, 2 research credits / +2 energy, −2 liquid waste

Purchasing and Placing Structures:

Listed on the Technology Map is the resource cost of each building or technology upgrade. The Resource Guardian pays the necessary resources to the Admiral. The Engineering Officer then places the appropriate colored building cube on the Habitat Card your team has chosen. The Chief of Operations then adds the building's operation score (listed on the Technology Map) to the Tabulation Board. Finally, your team should turn over the adjacent cards to reveal more resources.

Tabulating Operation Scores:

Each building and upgrade is associated with a specific plus or minus operation score. You can find these scores on the Technology Map. You must add these scores to the Tabulation Board after you place the building or technology upgrade. To do this, slide the paper clip the number of positions specified, left for minus scores and right for plus scores. For example, if there is a 'Food -2' score, slide the paper clip on the food column two positions to the left. If there is an 'Energy +3' score, slide the paper clip to the right three positions.

Some building categories (e.g. farms, wells, solar energy plants) directly tie to the resources scores listed on the Habitat Cards where you place the buildings. These buildings also have a + Card Score on the Technology Map. To record these values on the Tabulation Board, slide the paper clip to the right according to the resource number on the card. You cannot build or add an upgrade if it takes your Tabulation Board score beyond -7 or +10 in any resource category.

Unlocking Levels:

To unlock any of the technologies in the Interstellar level, you must first build an additional colony. Once you have the required number of colonies for a level, you will also have to pay Research Credits for each technology upgrade. Upgrading to Advanced Level technologies costs one Research Credit. Upgrading to the Interstellar Technologies cost two Research Credits, and to upgrade to the rocket fuel costs four Research Credits. You must upgrade your technologies in sequential order. No skipping to the rocket!

Upgrading Buildings:
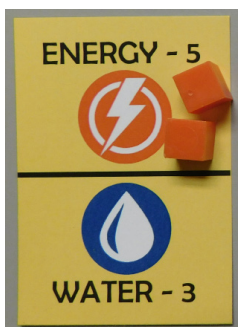
Begin by following the directions for Purchasing and Placing Buildings. When you upgrade a building technology, mark the upgrade by adding an additional cube in its corresponding color.

Purchasing Research Credits:

Research credits cost two energy resource cards, two water resource cards, and two food resource cards. Pay these to the Admiral.

Managing Wastes:

The solid and liquid wastes your team collects go into the waste pile. If you collect MORE THAN 15 of these cards, your team loses. You can build liquid and solid waste plants to manage this problem. If you have a negative score on the Tabulation Board in either of the waste categories, the waste plants can only remove that specific type of waste from the pile. It is important that the Sanitation Specialist keep track of growing waste problems before they wipe out your team.

Game Play Variations

Race Against Time:
In this setup, teams have a set time (anywhere between 45 minutes to an hour and a half) to get off the planet. The number of turns do not matter, but quick and efficient decisions are critical. The first team to beat the game wins.

Day by Day:
In this setup, teams count the total number of turns needed to achieve victory. The team able to win in the fewest turns wins.

Pack It In. Pack It Out:
In this version, use a variety of metrics to rank teams. Teams receive one point for each Level Two technology and two points for each Level Three technology they acquire. For each waste card left in the waste pile, the team loses one point.

Happy Hour:
In this version, multiple teams sync the timing of each turn. After every third turn, allow a trading period. Trading periods generally last around five minutes. Trading is free and open. This is a great way to encourage intergroup communication.

Credits:
This game was developed by the staff and students at the Bioenergy Education Initiative at Oregon State University. Website: agsci.oregonstate.edu/bioenergy-k-1.

Cover art for the Habitat Cards was developed from artwork made publicly available from NASA's Visions of the Future Project. Website: http://www.jpl.nasa.gov/visions-of-the-future/.

Some of the icon art used in the game cards is provided courtesy from the Noun Project. https://thenounproject.com/ Art from Oliviu Stoian, Ralf Schmitzer and Icon Island were used.