

## CHAPTER 5: ASTROGRAPHY AND BUILDING THINGS

Your Majesty, to truly understand how to improve your Empire, you must understand how its economy works. But before you can understand that, I want to talk a little bit about why worlds and systems matter, and what you want to look for when you expand to grow your economy.

### START WITH THE STARS AND CONSTELLATIONS

To start with, each star is generated randomly and can be a single, binary, or trinary star. This affects things like gravity and what types of planets are generated. Stars also have a spectral class from OB all the way to a D star, with our good old sun ('K') and red giants (RG), supergiants (SG), small blue stars, white stars, brown dwarves, neutron stars... they're all here, and each modeled by size, traits, and metallicity. These determine what types of planets and how many minerals are on each planet.

Once stars are generated, they are placed into constellations. This is another 'true to life' way of generating stars in a realistic manner. Not only does it provide a way to create provinces in 'grouping areas' but it makes it easier to find systems when you know what constellation it's in. The game has 30 constellations, each named by the game lore, but the only one that's guaranteed to show up in any given game is Enosis, your home constellation.

### LETS TALK ABOUT PLANETS!

So now that you've got your stars and your constellations, what about planets? Well, planets (and asteroid belts and ice belts) are procedurally generated from the type of star that is currently being generated from. There are only certain types of planets that can be generated, and each type has a weighted chance of being created. So you won't find a SuperEarth planet in a Red Giant, for instance, but you might find a Barren or Ice planet. Each system has 5 spots, from closest to farthest from the star, and the planets types are generated as well based on how far the planet 'slot' is from the star. So closer to the star, you will have lava and barren planets, while farther away you will have more ice and ice belts, as well as gas giants. Again, just like science.

So once the planet type is generated, we're not done! Next comes size and axial tilt (determines habitability) to determine how habitable the planet is to humans. Basically, the closer it is to a star, and the more tilted it is (violent weather changes), the Bio rating of a planet is generated, based on the base type of planet, size, location, and some variability.

Next, the industrial multiplier is generated. Certain planets are easier to build things like factories and mines (like desert planets and barren planets) as opposed to gas giants and lava planets, both for mineral richness and tectonic stability. This effects output of mines and factories.

Next, moons! Moons provide a few traits to a system, and tides, that sometimes improve the Bio of a planet.

Now we drop minerals and energy resources onto a planet! Again, each type of planet has a range of minerals that it may have, depending on the type of star and the metallicity of the star. Some planets are very likely to have a lot of energy (gas giants, lava, greenhouse planets) but lower levels of minerals, and vice versa. Since a huge part of the game is building up a strong resource economy, and since mining outposts and colonization projects take a lot of resources and time, finding the best planets and systems is part of your responsibilities as emperor to direct!

The types of planets in AotSS are:

- Asteroid Belt
- Barren
- Greenhouse
- Desert
- Terran
- Ice
- Ice Giant
- Gas Giant
- Ice Belt
- Lava
- Irradiated
- Super Earth
- Ocean
- Brown Dwarf
- Organic
- Dust Ring
- City

Some of these planet types are created rather than generated, especially City (think Trantor/Coruscant) and Organic (think living planet) but most can be found out there in the void. What will you find, Your Majesty?

## **DRILLING DOWN: PLANETARY REGIONS**

The last part of understanding the planets in your Empire is the concept of Regions. Now, Regions are interesting in that most of the time, as Emperor, you will not need to be aware of their existence. If you fly your air jet, and you decide to turn it left, you don't have to know the lift forces acting on the ailerons, nor do you have to know the yaw forces acting against the body to provide lift, drag, and spin. Nope, all you have to do is turn the stick to the left, apply some rudder, and voila! The plane turns left. Period.

The Region system works in much the same way. When a planet is generated, it's not one contiguous planet. Just like Earth is not all grassland, mountains, etc. most planets are an amalgamation of different terrain and biome types that put together create the overall planet structure and resources. Small planets might just have 4 Regions, while large Terran planets have as many as 20, and gas giants might have 36! (Of course, the vast majority of them will not be habitable!) Depending on the planet type, a given planet will have some of the following types of Regions:

- Plains
- Mountains
- Lava
- Volcanic
- Ocean
- Forest
- Grassland
- Jungle
- Barren
- Uninhabitable
- Frozen
- Desert
- Helium Islands
- Dead

Each type of region is more conducive than others to support life. That said, with the proper infrastructure ANY planet can sustain life, but your Pops don't have to like it (one reason why it's so important to build outposts in the right places – build it too far from other planets and you'll have a hell of a time convincing Miners and Engineers to come join, even if you are paying top dollar, if it's on a raging inferno planet)

So each region has its own type, but it also has unique modifiers for activities in the game, such as farming modifiers, bio modifiers, manufacturing modifiers, and even for ground combat (attack and defense mods). A plains region is going to be more attractive to a Pop than a lava region, obviously, but when a planet is colonized cities will be built in the regions that are most conducive to high production.

Cities, you say? Of course! Regions also have an infrastructure rating, from uninhabited to tiny outposts to small towns, all the way to super cities and megalopolises. The more resources your viceroy puts towards infrastructure, the larger your cities can grow, which will allow more people to be housed comfortably. That's the key. Each region has a maximum safe population level at which Pops will not grow discontent. You can exceed it, but then Pops will start to get unhappy with living stacked on top of each other, so they will eventually move to another

region, or if there's not another region with jobs and there's a better planet nearby, they'll simply leave. Building more infrastructure will prevent this.

So planets are not just a box of ratings and values, but a tapestry of regions that collectively form the planet. Again, as the player, you won't see most of this. You'll know how many regions the planet has, what types they are (percentage wise), what the base development level of a planet is, and the base population level it will support, and as infrastructure is built, you'll know how many more Pops the planet can support without Pops going haywire. Regions can be bombed from space or destroyed during ground combat, so losing a region with a Large City and numerous developments such as academies, factories, etc. will really hurt a planet's output. But the region system is why you will have one Terran planet with an 80 bio rating that has so-so farm output, and another Terran planet with a 75 bio rating that has awesome farm output, because the second Terran planet has a lot of ocean and plains regions with high output farming modifiers, while the first Terran planet has a lot of grassland and jungle. Still great for life, but not so great for farms. With mountains, however, it might be great for minerals! This is one facet of how planets tell their story and start to become unique.

And yes, Pops migrate around the planet looking for a better job, or a better opportunity (\*just like us! Hmmm) If you have a region on a planet that just opened up a new batch of farms, your Farmer that is living with 4 other people on the other side of the world just might move to that new region for the same job, but now he'll be a lot happier. As Emperor, you can create an Infrastructure Project on a world where you can send a massive construction armada to build more cities and towns, but this is much more expensive than to allow the planet to grow organically (a certain percentage of the planet's build points ALWAYS go towards expanding infrastructure, and automatically go where growth is creating the most problems). You can ask the viceroy to focus on infrastructure as well.

So what happens if you don't have enough materials (basic and heavy) to maintain your planet's infrastructure? Well... it starts to decay. And Pops don't like that so much. So it is incumbent on a good Viceroy to make sure that they beg, borrow, trade for, mine, or steal whatever they have to to ensure enough materials are on their planet to keep their lights on, their buildings up, and their roads from collapsing.

So now that you have a basic idea of why planets (and systems) matter and what to look for, let's dive into the economy and how it works over the next few lessons. We'll start with how things get built and maintained in your Empire, aka the Production System.

## **THE ECONOMY: THE PRODUCTION SYSTEM**

So first, an overview of the production system. There are 3 main materials that represent various minerals, materials, goods, and resources, collectively called 'basic', 'heavy', and 'rare' materials. These materials are used for 3 things: Projects, building things on planets, and maintaining your planets' infrastructure.

Basic materials are used for virtually everything in the game – from building and maintaining infrastructure to building everything from mines to spaceships. Fortunately, basic materials are fairly easy to produce and mine. Heavy materials are used mostly for space installations and ships, so any Projects that have space-based applications will use a lot of heavy materials, as well as upkeep. Rare materials are mostly used for science and for energy stations, as well as labs. While they are rare, they are not generally used much, especially for agriculture-based planets.

So how do you get these materials? Easy – they need to be mined (or traded for, but we'll get to that in another lesson). All planets have a basic, heavy, and rare material rating, that represents how easy it is to get materials from the planet. This is done by Miner Pops using mines. The more mines on a planet, that are staffed by Miners, with high skill ratings (and backed by a Viceroy with a high Mining aptitude) the more materials that can be mined. These are raw materials that are then stockpiled for use. A certain percentage of the goods are set aside for maintaining existing infrastructure, and another percentage of goods are set aside for trade, while another small percentage is set aside for retail (explained earlier, if you are allowing basic goods to be traded).

## **BUILD POINTS: HOW TO BUILD NEW THINGS ON PLANETS**

Now we get to the second part of the process, which is creating Build Points (BPs) that actually go towards construction of infrastructure, ships, etc.

BPs are split into their three types – basic, heavy, and rare. Each structure that you build in AotSS takes a certain amount of BPs. For example, to build a new farm takes 30 basic BPs, 5 heavy BPs, and 0 rare BPs. By contrast, to build a new power generator (High-Tech), it takes 70 Basic BPs, 40 Heavy BPs, and 15 Rare BPs. These BPs are generated each turn and accumulate based on the build plan of the viceroy. The actual math to determine how a BP is generated is rather lengthy, but the basic calculation is to take how many factories are online (meaning they are staffed, one Pop to one factory), take the amount of raw materials that are allocated (based on the build plan; this can be overdriven as well if you have an aggressive viceroy) and take into account the engineer's ratings and the viceroy's Engineering aptitude (if any) plus their House's engineering skill, take a industrial multiplier (kind of like the overdrive in MOO3) that the viceroy can use to overwork their engineer pops to get more build points at the cost of unhappiness and possible revolt) and voila! BPs fresh out of the oven. You can see the amount of BPs that each planet is currently producing by clicking on the 'Production' button on the Planet Governance Level in Economic Mode. This panel will also show you the planet's Build Focus.

Next, the BPs are allocated to the planetary Build Plan.

## **BUILD PLANS**

The build plan is basically how the viceroy chooses to allocate the BPs that are generated monthly. So, for example, if the viceroy focused on farms, they might allocate 50% BPs to farms, 25% BPs to infrastructure (houses, apartments, and the like), and 25% to high-tech. So each month, farms would get half of the BPs, infrastructure would get 25%, and so on. Focuses can swing these build plans, and are one way you as the emperor can change the build ratios of a planet. You can ask a Viceroy to change their Build Plans through an Action to do so. To see the current Build Plan of a planet, click on the Build Plan button on the Planet Governance Level in Economic Mode. This will show you the percentage of the total BPs that are generated that will be allocated to each category, and how far the next level/item is from completion (shown by a green bar that fills from left to right)

Note that Build Plans are different from Designations. Designations are essentially an Imperial fiat to develop a planet a very specific way, and a Viceroy MUST comply. It involves tearing down and recycling any industry that is not needed beyond the minimum to support a basic Population. For an established planet, changing a Designation can be a searing process, but perhaps necessary to the existence of the Empire if a certain type of planet needs to be developed a certain way. Build Plans, on the other hand, are more of a 'nudge' for your Viceroy to build, say, more Admin. If they agree, they will build more than they had before, but they're going to decide what 'more' means, not you. However, it is much less disruptive to your Pops and planet, and does not cost you anything (but the AP for the Action, of course)

## **UPKEEP/INFRASTRUCTURE**

You also need to be able to pay for the upkeep of each level of development on your planet, which takes materials. If you are running out of materials, your most high-tech structures will start to decay and shut down, putting your Pops out of work (and they won't be happy about it). Eventually, your farms will shut down, your food supply will dry up, and you'll be living on stockpiles and/or trades until you get your development rebuilt. In game terms, there is a percentage chance that increases slowly each turn a level of development can't be maintained. Once it's shut down, it effectively needs to be rebuilt and re-staffed.

To see the overage/shortfall for each resource, you can click on the Production button on the Planetary Governance Level, Economic Mode. It will show you 4 quadrants, clockwise from top-left: Employment per Pop, Skill Level Average for each Pop type (with the Viceroy's Skill Modifier in parenthesis), Output of each Resource, and Facilities for each Resource. The colored bars show capacity – so if a Facilities bar is completely green and filled, that means that all facilities on the planet for that Resource are staffed by Pops. If a bar on the Employment is short and red, it means that a lot of those Pops are unemployed – and not happy about it! You may want to build more of their Facilities that they need, or relocate them by making other planets nearby more desirable, etc.

So that's the process in a nutshell. As the emperor, you want to make sure that your planets have enough raw materials to ensure that their factories can run at maximum efficiency. You

also want to attract Engineers and Miners with high skill ratings, and you want to install a Viceroy who comes from a strong engineering and mining House (probably Illoaia or Hawken) (Now you start to see why you might want to keep certain Houses in your good graces – it's hard to build a manufacturing powerhouse world if you can't get a Viceroy who'd be suited to run it!) You will be able to bring 'prefab' factories to planets in emergencies, but this is a Project and will cost much more in materials and coin than building factories would in the first place, but if you let your factories go this may create a 'death spiral' where you don't have any factories left to rebuild! Don't let this happen.

The next lesson, Your Majesty, focuses on your Economic side of things – in other words, how you make money! Let's continue...