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Token Model

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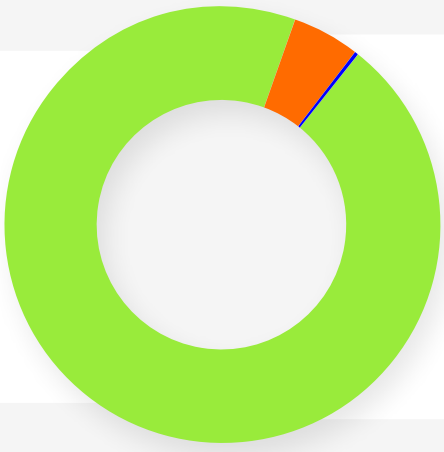
1.1 Generalities

PlanetWatch has issued a utility token on the Algorand blockchain in the form of an Algorand Standard Asset (ASA). The name of the token is PLANET. The maximum token supply is 4,500,000,000. This figure was chosen as it corresponds to the estimated age in years of the Earth. All tokens have been minted at the start of the project. A number of tokens corresponding to 5% of the maximum token supply was immediately allocated to PlanetWatch. The remainder of the tokens are being released over time and allocated to reward data streams. During the test phase of the project, 2 million Planets were allocated to reward data streams. As soon as this allocation will be exhausted, the project will be launched officially. Then the present token model shall apply and the total amount of tokens allocated to data rewards shall be 4,273,000,000. For technical reasons, a transition period will occur between the end of the test phase and the official launch. During the transition period, which will last at most 24 hours, no rewards will be allocated. It is expected that the transition will occur before the end of March 2021.



5% Initial PlanetWatch allocation
225,000,000

0,04% Data rewards during test phase
2,000,000

94,96% Data rewards following launch
4,273,000,000

Maximum Token Supply
4,500,000,000

Token Model

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Following the launch, the token release schedule is set at 534,125,000 Planets/year. This rate will be halved every four years. The release schedule enforces the hard cap of 4.5 Billion Planets (see schedule below).

Token Release Schedule

Year	Tokens/year	Total tokens	Year	Tokens/year	Total tokens
1	534,125,000	534,125,000	31	4,172,852	4,252,135,742
2	534,125,000	1,068,250,000	32	4,172,852	4,256,308,594
3	534,125,000	1,602,375,000	33	2,086,426	4,258,395,020
4	534,125,000	2,136,500,000	34	2,086,426	4,260,481,445
5	267,062,500	2,403,562,500	35	2,086,426	4,262,567,871
6	267,062,500	2,670,625,000	36	2,086,426	4,264,654,297
7	267,062,500	2,937,687,500	37	1,043,213	4,265,697,510
8	267,062,500	3,204,750,000	38	1,043,213	4,266,740,723
9	133,531,250	3,338,281,250	39	1,043,213	4,267,783,936
10	133,531,250	3,471,812,500	40	1,043,213	4,268,827,148
11	133,531,250	3,605,343,750	41	521,606	4,269,348,755
12	133,531,250	3,738,875,000	42	521,606	4,269,870,361
13	66,765,625	3,805,640,625	43	521,606	4,270,391,968
14	66,765,625	3,872,406,250	44	521,606	4,270,913,574
15	66,765,625	3,939,171,875	45	260,803	4,271,174,377
16	66,765,625	4,005,937,500	46	260,803	4,271,435,181
17	33,382,813	4,039,320,313	47	260,803	4,271,695,984
18	33,382,813	4,072,703,125	48	260,803	4,271,956,787
19	33,382,813	4,106,085,938	49	130,402	4,272,087,189
20	33,382,813	4,139,468,750	50	130,402	4,272,217,590
21	16,691,406	4,156,160,156	51	130,402	4,272,347,992
22	16,691,406	4,172,851,563	52	130,402	4,272,478,394
23	16,691,406	4,189,542,969	53	65,201	4,272,543,594
24	16,691,406	4,206,234,375	54	65,201	4,272,608,795
25	8,345,703	4,214,580,078	55	65,201	4,272,673,996
26	8,345,703	4,222,925,781	56	65,201	4,272,739,197
27	8,345,703	4,231,271,484	57	32,600	4,272,771,797
28	8,345,703	4,239,617,188	58	32,600	4,272,804,398
29	4,172,852	4,243,790,039	59	32,600	4,272,836,998
30	4,172,852	4,247,962,89	60	32,600	4,272,869,598

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Ⓐ Earth Credits

Planet tokens can be redeemed against products and services (e.g. air purifiers) by first converting them into Earth Credits. These are non-transferable credits with a fixed redemption value of 0.10 €. Earth Credits can either be obtained in exchange for Planets, or purchased directly on the PlanetWatch website. They are priced as follows:

- **0.10** € if paid in euros
- **0.09** € if obtained by redeeming Planets at the prevailing Planet/EUR market rate.

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1.2 Data Reward Policy

A General Principles

PlanetWatch is building a network of sensors and people who are keen to participate in a global effort to deliver more effective environmental monitoring. Out of this effort, the key deliverable is an extensive body of hyperlocal, near real-time air quality data. The dataset is built out of data streams sent by sensors connected to PlanetWatch. Planet rewards are then issued in return for valid data streams, based on the intrinsic value of each stream.

The value of a stream depends on data content and reliability.

For outdoor sensors, it also depends on the stream origination location and the availability of streams from comparable sensors nearby.

In order to assess the value of data streams according to the above criteria, we introduce a set of classification rules.

B Sensor types

In order to cover all the Air Quality Monitoring use cases identified by PlanetWatch, we need different types of sensors. PlanetWatch-approved sensors are divided as follows:

- **Type 1**: Premium outdoor devices
- **Type 2**: Consumer-grade outdoor devices
- **Type 3**: Indoor devices
- **Type 4**: Wearable and special devices

For each sensor type, we set a default streaming frequency, which determines the maximum number of streams per day which can be rewarded:

Daily streams per sensor	Type 1	Type 2	Type 3	Type 4
Streming time interval (minutes)	15	15	5	2
Daily streams	96	96	288	720

The number of actual data streams sent to our platform may be higher or lower than the default value. If higher, the default value acts as a cap on the number of streams which can be rewarded.

Token Model

The data reward pool is split into sub-pools for each sensor type as shown in the table below. We also show, based on a 534,125,000 Planets total reward pool in year 1, the projected Planet annual and daily reward budget breakdown:

	Type 1	Type 2	Type 3	Type 4
Reward breakdown per sensor type	40%	20%	20%	20%
Year 1 reward budget	213,650,000	106,825,000	106,825,000	106,825,000
Daily reward budget	585,342	292,671	292,671	292,671

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© Pixels

We overlay upon the Earth a grid of rectangular pixels. Pixel size is 0.72 km2 (0.278 sq. mi.). Pixels are classified according to a 2-tier system:

- **Tier 1**: Areas with high population density
- **Tier 2**: Rest of the world

The classification is based on worldwide population density data made available by the European Commission under its Global Human Settlement Layer Tier 1 pixels are those where the population density is estimated at 2,000 inhabitants per square kilometer or more (dataset here).

The reward pool for outdoor sensors (Type 1 and 2) is further split across pixel tiers (70% for Tier 1 and 30% for Tier 2). We show below the projected Planet daily reward budget breakdown per Tier in year 1.

	Type 1	Type 2	Type 3	Type 4
Daily reward budget Tier 1	409,740	204,870	292,671	292,671
Daily reward budget Tier 2	175,603	87,801		

The pixel structure is instrumental to implementing a reward policy driven by our outdoor monitoring goal: equip as many pixels as possible worldwide with one Type 1 sensor and five Type 2 sensors per pixel. This mix of sensors strikes an optimal balance between data density, quality and deployment costs.

In order to incentivize sensor deployment in compliance of the above guidelines and to reward steady sensor performance, we establish some additional definitions and rules.

(D) Sensor Reputation System

Each sensor is awarded a 100-point setup bonus the first time it is connected to the PlanetWatch network. The performance of each sensor in the network is assessed daily and a score is assigned as follows:

- If the sensor has delivered more than 50% of the expected daily data streams (e.g. more than 48 streams for Type 1 sensors), it is deemed *qualifying* and it earns one point,
- If the sensor has failed to deliver more than 50% of the expected daily data streams, it is *not qualifying* and loses one point.

For Type 1 and Type 2 sensors, additional rules apply.

- In each pixel, the Type 1 sensor which gets installed first and streams data for at least 30 qualifying days from that pixel is entitled to a 100-point Pioneer bonus. Likewise, the first five Type 2 sensors installed in each pixel earn the Pioneer bonus. These bonuses can only be earned once in a sensor's lifetime, even if the sensor changes location.
- For a given sensor, a Local Reputation Score applies in each pixel. If a sensor is moved to a new location in another pixel, its Local Reputation Score in this new location starts at 0, regardless of its score in the previous pixel(s). Over time, it will earn reputation points in the new pixel (if it qualifies) and lose points in the old one(s).

The Global Reputation Score of a sensor, summed across all relevant pixels, is only relevant in the context of governance, since voting rights are linked to a sensor's aggregate reputation score across all pixels.

(E) **Lead vs Backup Sensors** (Type 1 and Type 2 only)

In each pixel, the Type 1 sensor with the highest Local Reputation Score enjoys the status of lead Type 1 sensor. Likewise, the five Type 2 sensors with the highest Local Reputation Score are the lead Type 2 sensors. Other Type 1 and Type 2 sensors in that pixel (if any) are regarded as backup sensors.

Lead sensors enjoy higher rewards, as in each pixel and for each sensor type, rewards are split as follows: 90% to the lead sensor(s) and 10% to the backup sensor(s). Clearly if there are no backup sensors, 100% of the reward pool goes to the lead ones. In each pixel, sensor scores are updated daily so lead status is reassessed every day.

If two or more sensors of the same type have the same Local Reputation Score in a given pixel, priority to get lead status is attributed to the sensor which first streamed data in that pixel.

F Reward Rates

We have set a maximal reward rate per stream. For Type 1 and Type 2 sensors, the rate depends on sensor location via the pixel tier system and also depends on whether or not the sensor has lead status and backup sensors are present. (see table below).

Max Reward per Stream		Type 1	Type 2	Type 3	Type 4
Tier 1 pixel	Lead Sensor	1.736	0.200	0.134	0.040
	Backup Sensor	0.174	0.020		
Tier 2 pixel	Lead Sensor	0.868	0.134		
	Backup Sensor	0.087	0.013		

All rewards earned by sensors are split as follows:

- **Sensor owner (also called miner) 80%**
  PlanetWatch 20%.

- PlanetWatch provides a tool allowing the sensor owner to split rewards with a third party (e.g. a friend hosting the sensor).

Keeping into account all the rules and definitions set forth above, we can provide estimates for the maximum daily rewards per sensor based on sensor type and pixel tier (whenever applicable):

Max Daily Reward		**Type 1**	**Type 2**	**Type 3**	**Type 4**
Tier 1 pixel	Lead Sensor	166.65	19.23	38.46	28.84
	Backup Sensor	16.66	1.92		
Tier 2 pixel	Lead Sensor	83.82	12.82		
	Backup Sensor	8.33	1.28		
Max Miner (80%) **Daily Earnings**		**Type 1**	**Type 2**	**Type 3**	**Type 4**
Tier 1 pixel	Lead Sensor	133.32	15.38	30.77	23.07
	Backup Sensor	13.33	1.54		
Tier 2 pixel	Lead Sensor	66.66	10.26		
	Backup Sensor	6.67	1.03		

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G Reward Pool Dynamics

As mentioned above, the maximum daily reward per sensor is capped. On the other hand, the number of tokens allocated to the daily data reward pool is 1/365 of the annual token release schedule, split according to sensor types and pixel tiers when applicable.
As a consequence, at some point in time the number of sensors in the network will get large enough to "saturate" the daily rewards budget.

For each sensor type and pixel tier, the saturation point can be defined as the maximum number of (lead) sensors that are able to receive the maximum daily reward allocation without going over the protocol's reward pool budget. When the number of (lead) sensors exceeds the saturation point, daily rewards per sensor start decreasing. The figures in the table below are based on 534,125,000 Planets in the annual reward pool.

Saturation points	Type 1	Type 2	Type 3	Type 4
Tier 1 pixel	2,459	10,654	7,610	10,147
Tier 2 pixel	2,107	6,849		

Conversely, as long as the number of sensors is below the saturation point, since rewards per sensor are capped, a fraction of tokens from the daily budget will not be used. Unused tokens will fill a "recycling bin" budget. In the early stages of the project, we expect that a large fraction of the rewards budget will end up in the recycling bin.

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(H) Additional contributions to the Reward Pool

Over time, the combined effect of a strong increase in the number of sensors and the halving events occurring every four years would make it difficult to reward data streams with a meaningful number of tokens. To mitigate this, two additional contributions to the reward pool are envisaged:

① When a saturation point is attained, tokens in the recycling bin are added to the reward pool's scheduled daily token issuance, up to the extent that is needed to restore maximum daily rewards for each sensor (if a sufficient number of tokens is available in the recycling bin).

② Whenever Earth Credits are used to get access to air quality data, revenues are converted back into Planets and allocated as follows:

Revenues From Data Access Sales

To sensors originating sold data | Added to recycling bin | To PlanetWatch

These additional "emissions" help fill the recycling bin while enforcing a strict maximum Planet supply.

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