

PVsyst - Simulation report

Grid-Connected System

Project: Kopellis_ Fixed

Variant: 114 kW Fixed

Sheds, single array

System power: 114 kWp

Thessaloniki/Livadákion - Greece

**PVsyst V7.2.15**

VC1, Simulation date:
17/06/22 00:54
with v7.2.15

Project summary**Geographical Site**

Thessaloniki/Livadákion
Greece

Situation

Latitude 40.52 °N
Longitude 22.97 °E
Altitude 4 m
Time zone UTC+2

Project settings

Albedo 0.20

Meteo data

Thessaloniki/Livadákion
Meteonorm 8.0 (1994-2006), Sat=14% - Synthetic

System summary**Grid-Connected System****PV Field Orientation**

Fixed plane
Tilt/Azimuth 25 / 0 °

Sheds, single array**Near Shadings**

Linear shadings

User's needs

Unlimited load (grid)

System information**PV Array**

Nb. of modules 216 units
Pnom total 114 kWp

Inverters

Nb. of units 1 unit
Pnom total 111 kWac
Pnom ratio 1.031

Results summary

Produced Energy 176.3 MWh/year Specific production 1540 kWh/kWp/year Perf. Ratio PR 87.50 %

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General parameters**Grid-Connected System****PV Field Orientation****Orientation**

Fixed plane

Tilt/Azimuth 25 / 0 °

Horizon

Average Height 7.4 °

Sheds, single array**Sheds configuration**

Nb. of sheds 4 units

Single array

Sizes

Sheds spacing 10.00 m

Collector width 4.57 m

Ground Cov. Ratio (GCR) 45.7 %

Top inactive band 0.02 m

Bottom inactive band 0.02 m

Shading limit angle

Limit profile angle 18.4 °

Near Shadings

Linear shadings

Models used

Transposition Perez

Diffuse Perez, Meteonorm

Circumsolar separate

User's needs

Unlimited load (grid)

PV Array Characteristics**PV module**

Manufacturer

Model

Generic
JKM530M-72HL4-BDVP

(Custom parameters definition)

Unit Nom. Power

530 Wp

Number of PV modules

216 units

Nominal (STC)

114 kWp

Modules

8 Strings x 27 In series

At operating cond. (50°C)

Pmpp

105 kWp

U mpp

995 V

I mpp

105 A

Total PV power

Nominal (STC)

114 kWp

Total

216 modules

Module area

557 m²

Cell area

514 m²

Inverter

Manufacturer

Model

Generic
SG111-HV

(Original PVsyst database)

Unit Nom. Power

111 kWac

Number of inverters

1 unit

Total power

111 kWac

Operating voltage

780-1450 V

Pnom ratio (DC:AC)

1.03

Total inverter power

Total power

111 kWac

Number of inverters

1 unit

Pnom ratio

1.03

Array losses**Array Soiling Losses**

Loss Fraction 1.5 %

Thermal Loss factor

Module temperature according to irradiance

Uc (const) 29.0 W/m²K

Uv (wind) 0.0 W/m²K/m/s

DC wiring losses

Global array res. 104 mΩ

Loss Fraction 1.0 % at STC

Module Quality Loss

Loss Fraction 0.0 %

Module mismatch losses

Loss Fraction 0.6 % at MPP

IAM loss factor

Incidence effect (IAM): User defined profile

0°	30°	50°	60°	70°	75°	80°	85°	90°
1.000	1.000	1.000	1.000	0.989	0.967	0.924	0.729	0.000

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System losses**Auxiliaries loss**

Proportionnal to Power 4.0 W/kW
0.0 kW from Power thresh.

AC wiring losses**Inv. output line up to MV transfo**

Inverter voltage 540 Vac tri
Loss Fraction 0.21 % at STC

Inverter: SG111-HV

Wire section (1 Inv.) Copper 1 x 3 x 240 mm²
Wires length 70 m

AC losses in transformers**MV transfo**

Grid voltage 20 kV

Operating losses at STC

Nominal power at STC 113 kVA
Iron loss (24/24 Connexion) 0.11 kW
Loss Fraction 0.10 % at STC
Coils equivalent resistance 3 x 25.76 mΩ
Loss Fraction 1.00 % at STC



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Horizon definition

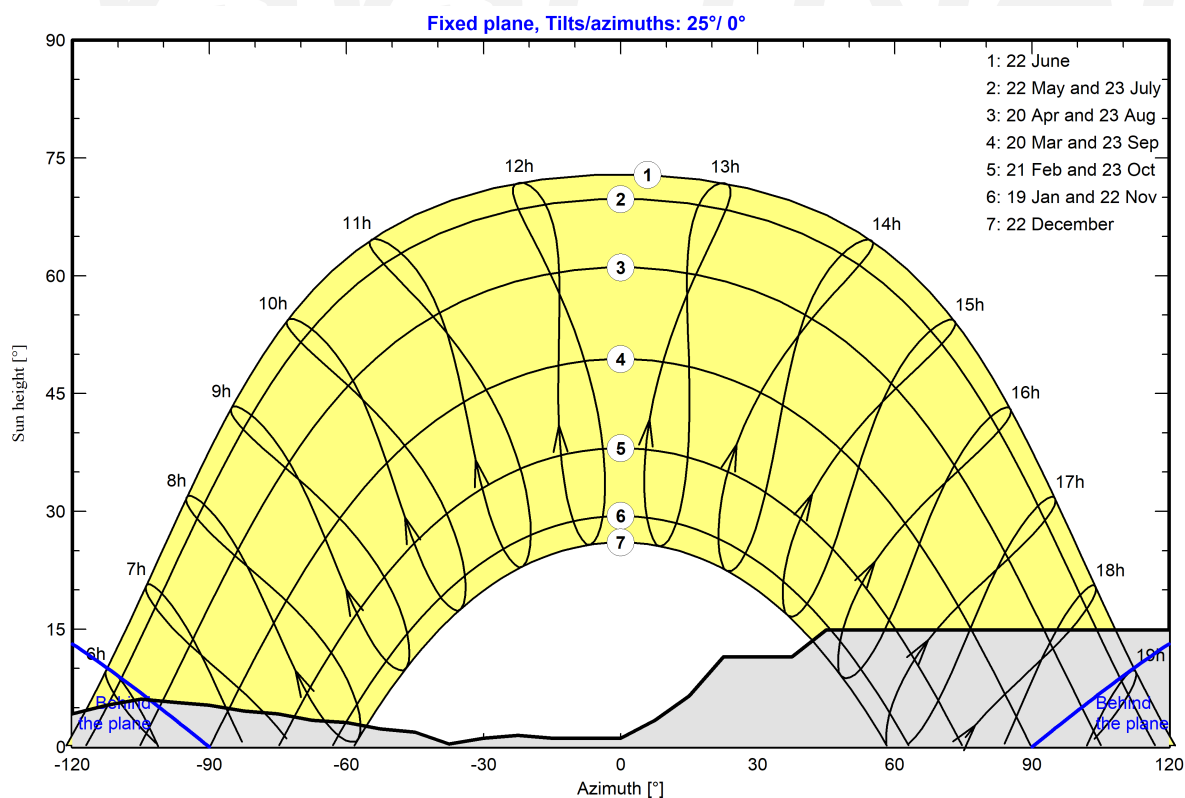
Horizon from PVGIS website API, Lat=39°37'58", Long=22°13'41", Alt=153m

Average Height	7.4 °	Albedo Factor	0.73
Diffuse Factor	0.96	Albedo Fraction	100 %

Horizon profile

Azimuth [°]	-180	-173	-165	-158	-143	-135	-128	-120	-113	-105	-98	-90
Height [°]	1.9	3.4	4.6	5.7	7.3	6.5	4.6	4.2	5.3	6.1	5.7	5.3
Azimuth [°]	-83	-75	-68	-60	-53	-45	-38	-30	-23	-15	0	8
Height [°]	4.6	4.2	3.4	3.1	2.3	1.9	0.4	1.1	1.5	1.1	1.1	3.4
Azimuth [°]	15	23	38	45	135	143	150	158	165	173	180	
Height [°]	6.5	11.5	11.5	14.9	14.9	8.0	8.0	5.3	1.9	1.5	1.9	

Sun Paths (Height / Azimuth diagram)



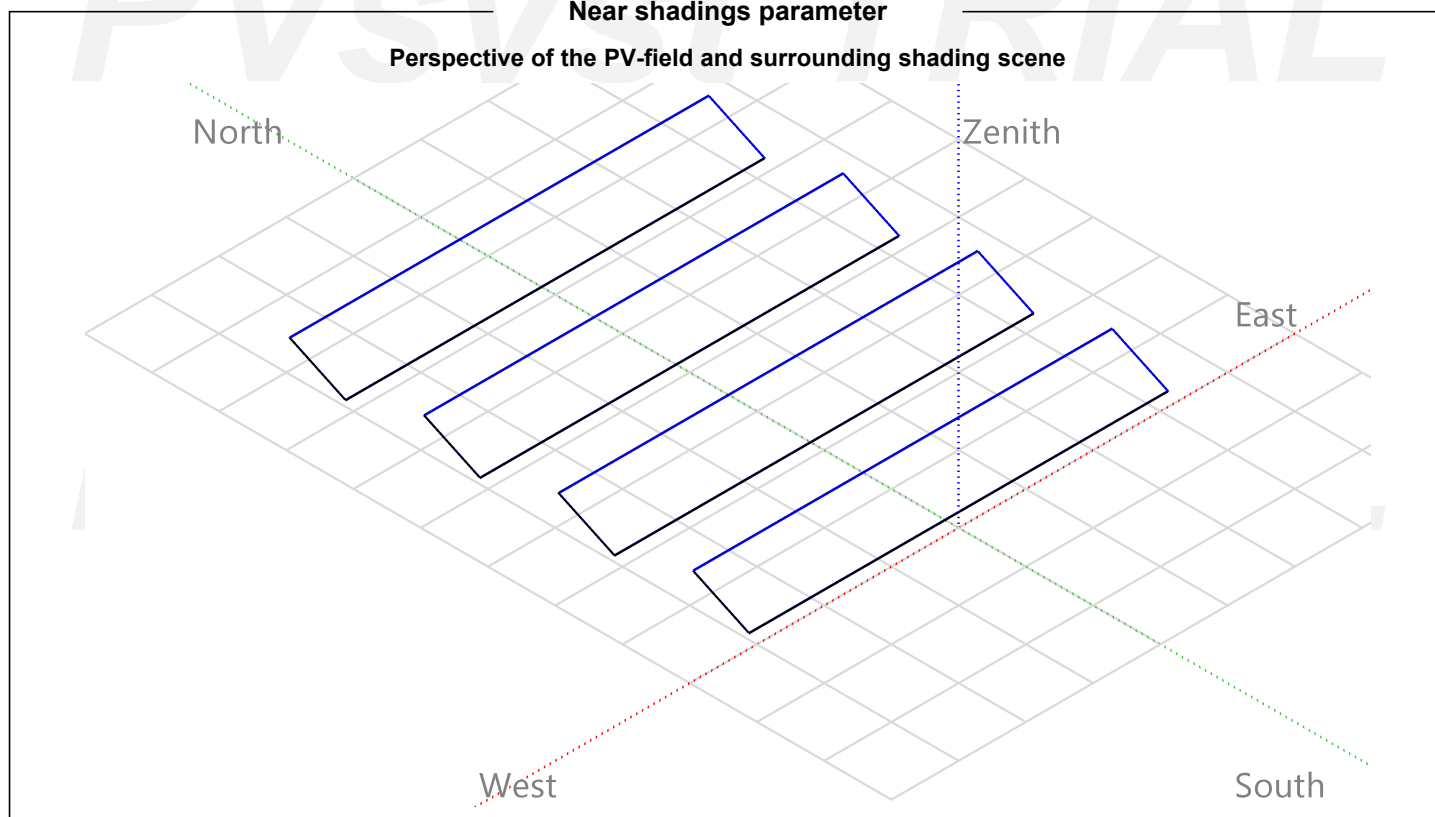


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Near shadings parameter

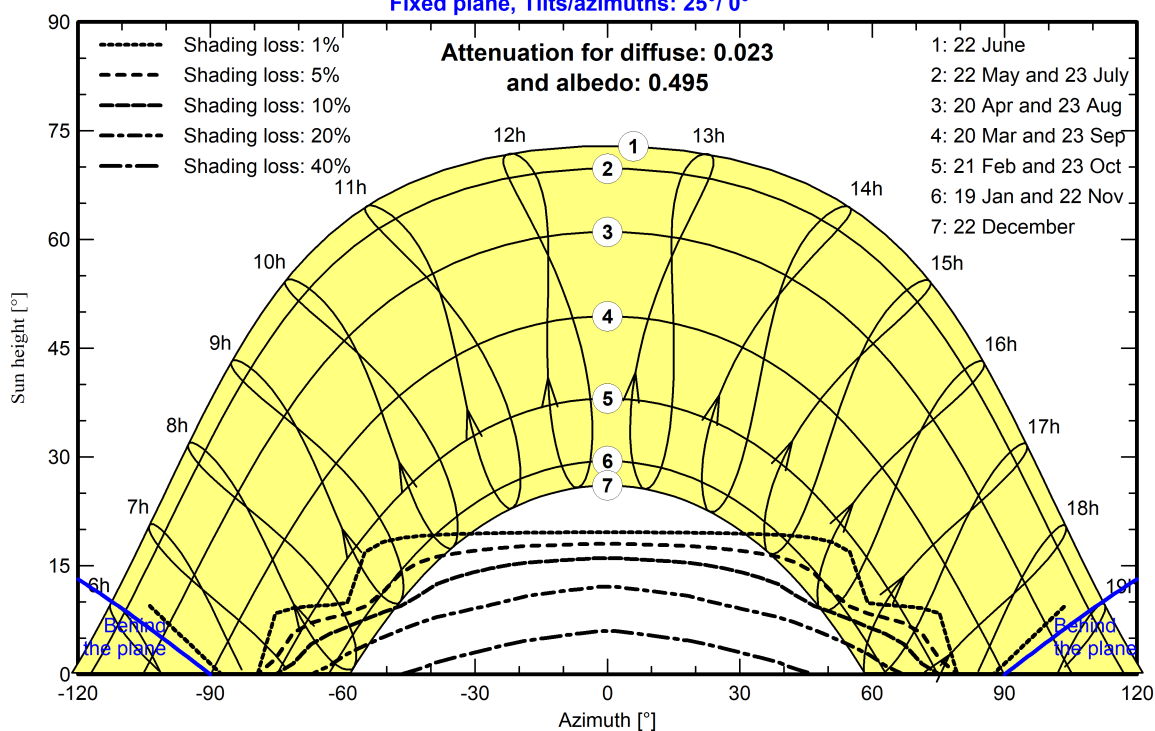
Perspective of the PV-field and surrounding shading scene



Iso-shadings diagram

Orientation #1

Fixed plane, Tilts/azimuths: 25°/ 0°





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Main results

System Production

Produced Energy

176.3 MWh/year

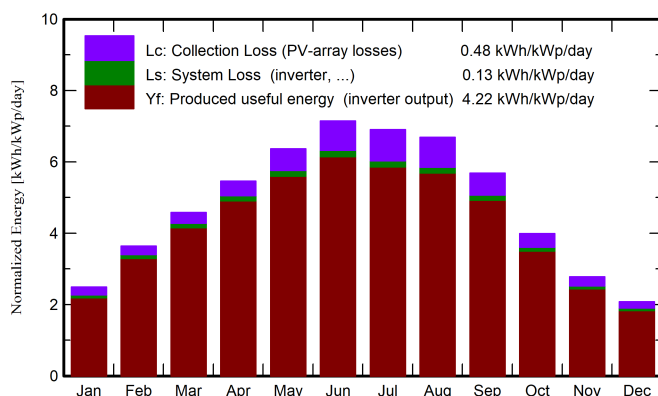
Specific production

1540 kWh/kWp/year

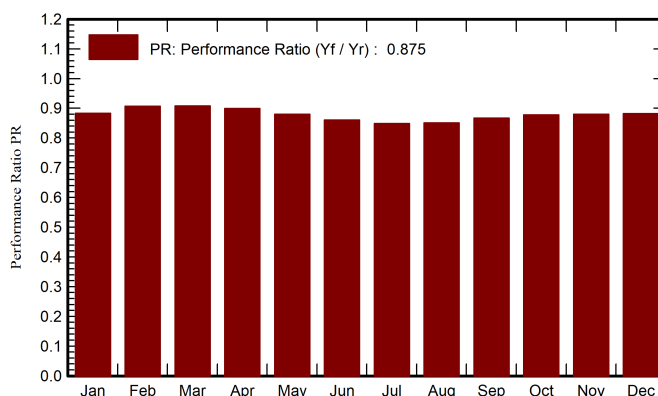
Performance Ratio PR

87.50 %

Normalized productions (per installed kWp)



Performance Ratio PR



Balances and main results

	GlobHor	DiffHor	T_Amb	GlobInc	GlobEff	EArray	E_Grid	PR
	kWh/m ²	kWh/m ²	°C	kWh/m ²	kWh/m ²	MWh	MWh	ratio
January	52.6	29.21	4.95	77.1	69.5	8.07	7.80	0.883
February	76.4	39.36	6.71	101.9	95.2	10.91	10.58	0.907
March	118.0	57.36	9.91	142.1	134.9	15.21	14.77	0.908
April	150.3	77.02	13.73	163.7	156.5	17.36	16.87	0.900
May	195.0	84.41	19.52	197.3	189.3	20.44	19.88	0.880
June	218.4	75.24	24.54	214.4	206.4	21.74	21.13	0.861
July	214.7	82.15	27.83	213.9	205.4	21.40	20.80	0.849
August	194.0	76.29	27.71	207.3	199.1	20.77	20.20	0.851
September	144.2	53.93	21.67	170.5	162.8	17.42	16.92	0.867
October	94.1	43.87	16.53	123.7	116.1	12.82	12.44	0.878
November	57.9	29.79	11.46	83.2	76.7	8.67	8.38	0.880
December	43.4	24.96	6.66	64.5	58.6	6.76	6.51	0.882
Year	1559.1	673.58	15.99	1759.8	1670.5	181.56	176.28	0.875

Legends

GlobHor Global horizontal irradiation

DiffHor Horizontal diffuse irradiation

T_Amb Ambient Temperature

GlobInc Global incident in coll. plane

GlobEff Effective Global, corr. for IAM and shadings

EArray Effective energy at the output of the array

E_Grid Energy injected into grid

PR Performance Ratio



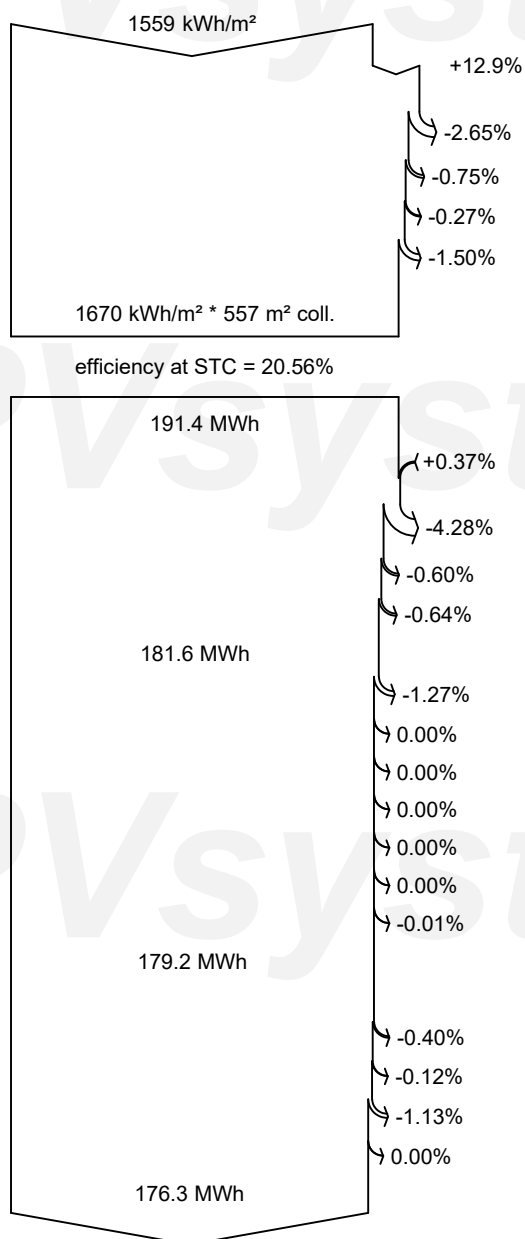
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Loss diagram



Global horizontal irradiation

Global incident in coll. plane

Far Shadings / Horizon

Near Shadings: irradiance loss

IAM factor on global

Soiling loss factor

Effective irradiation on collectors

PV conversion

Array nominal energy (at STC effic.)

PV loss due to irradiance level

PV loss due to temperature

Module array mismatch loss

Ohmic wiring loss

Array virtual energy at MPP

Inverter Loss during operation (efficiency)

Inverter Loss over nominal inv. power

Inverter Loss due to max. input current

Inverter Loss over nominal inv. voltage

Inverter Loss due to power threshold

Inverter Loss due to voltage threshold

Night consumption

Available Energy at Inverter Output

Auxiliaries (fans, other)

AC ohmic loss

Medium voltage transfo loss

MV line ohmic loss

Energy injected into grid

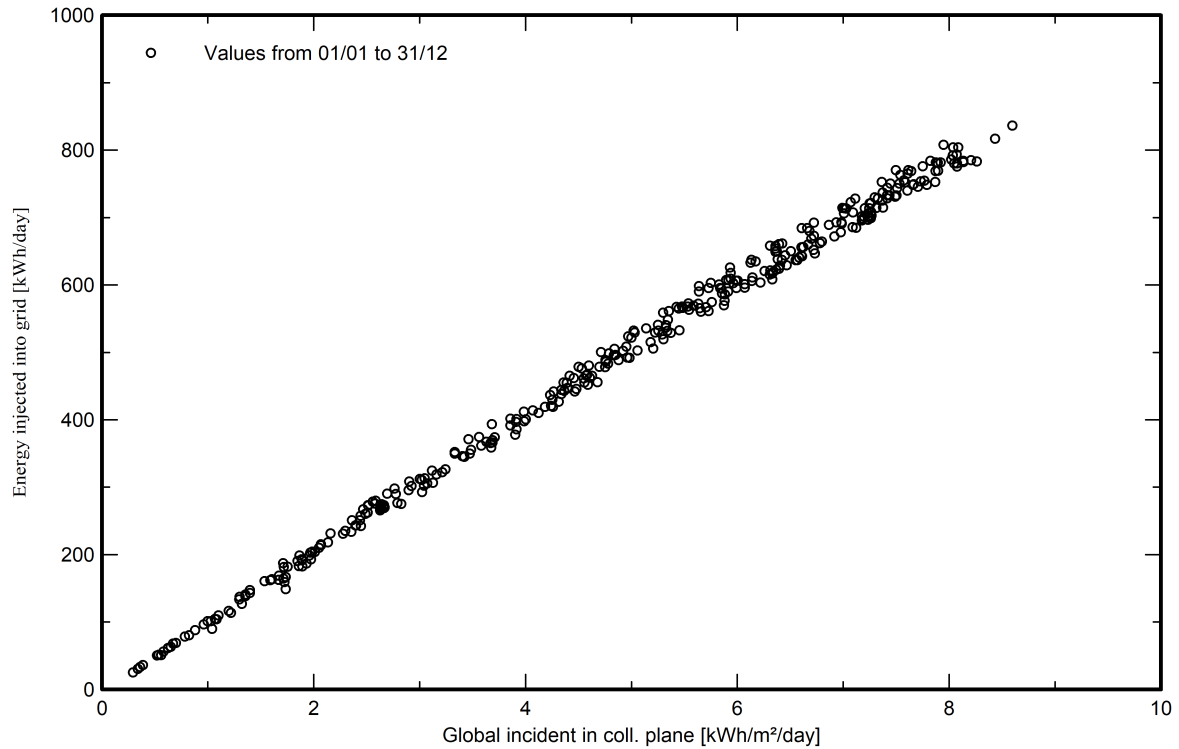


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Special graphs

Daily Input/Output diagram



System Output Power Distribution

