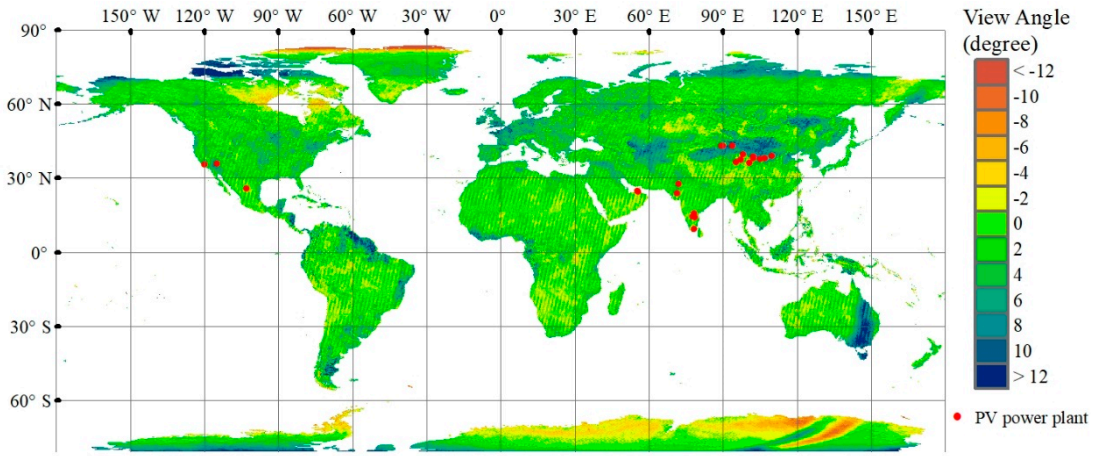


Figure S1. The annual mean view angle from MODIS Terra during daytime in 2018.

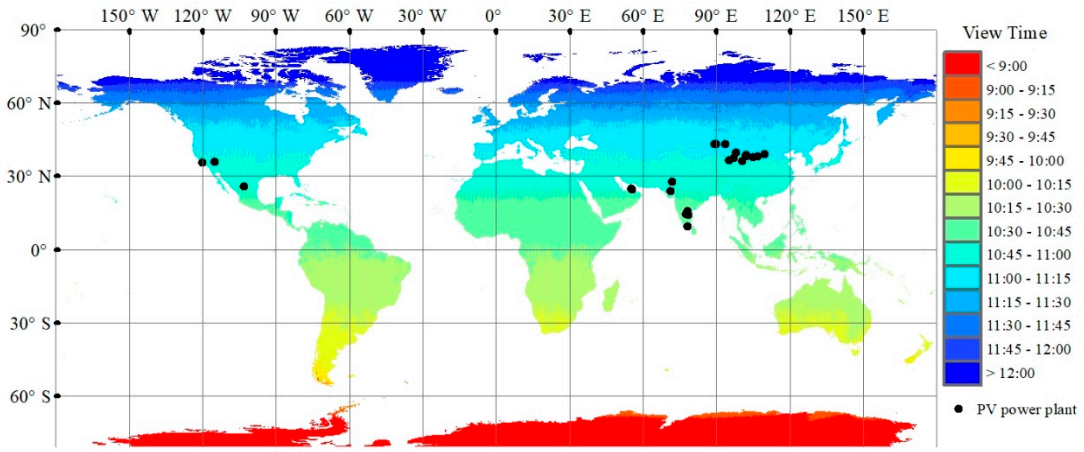


Figure S2. The annual mean view time from MODIS Terra during daytime in 2018.

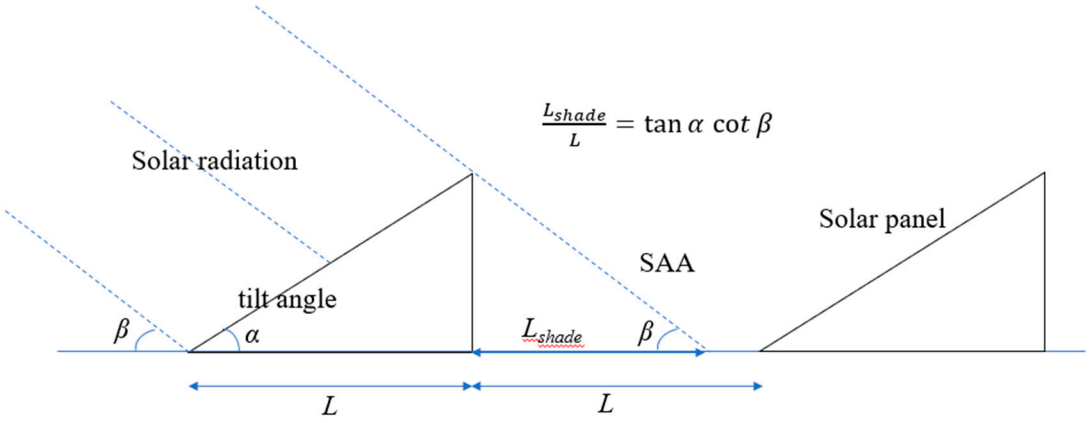


Figure S3. Diagrammatic sketch of PV panels. The α is tilt angle of PV panel, which is equal to the latitude of the PV powerplant [74], and the β is solar altitude angle (SAA).

Table S1. The values of emissivities in bands 31 and 32 of MODIS LST product based on the classification-based emissivity model [59].

Description of landcover (type #)	emissivity_31 (10.8-11.3 μm)	Emissivity_32 (11.8-12.3 μm)
Water (0)	0.992	0.988
Evergreen needleleaf forest (1)	0.987	0.989
Evergreen broadleaf forest (2)	0.981	0.984
Deciduous needleleaf forest (3)	0.987	0.989
Deciduous broadleaf forest (4)	0.981	0.984
Mixed forest (5)	0.981	0.984
Closed shrublands (6)	0.983	0.987
Open shrublands (7)	0.972	0.976
Woody savannas (8)	0.982	0.985
Savannas (9)	0.983	0.987
Grasslands (10)	0.983	0.987
Permannet wetlands (11)	0.992	0.988
Croplands (12)	0.983	0.987
Urban and built-up (13)	0.97	0.976
Cropland and mosaics (14)	0.983	0.987
Snow and ice (15)	0.993	0.99
Bare soil and rocks (16)	0.965	0.972
Unclassified (17)	0.978	0.981

Table S2. Comparison of the emissivity of the sands, dry vegetation and PV solar cells.

Type	Emissivity (10.5-12.5 μm)	Reference	Type	Emissivity (10.5-12.5 μm)	Reference
Sandsoils	0.969	[62]	**Solar cell with glass**	0.960	[63]
Slimy soils	0.972	-			
Clayey soils	0.974	-	**Solar cell with glass**	0.950	[64]
Dry herbs	0.951	-			
Coral Pink Sands (dry)	0.964	[61]			
Great Sands (dry)	0.953	-			
Coral Pink Sands (Soil moisture 7.3%)	0.959	-			
Great Sands (Soil moisture 5.9%)	0.953	-			
Coral Pink Sands (Soil moisture 10.3%)	0.959	-			
Great Sands (Soil moisture 9.5%)	0.953	-			
Coral Pink Sands (Soil moisture 13.4%)	0.959	-			
Great Sands (Soil moisture 12.6%)	0.950	-			
Mean soil emissivity in drylands	**0.960**		**Mean emissivity of solar cell**	**0.955**	

Table S3. The cavity effect of the PV panels in different PV powerstations.

PV power plant No.	Latitude (°)	Cavity effect $d\varepsilon$
1	36.13	0.006
2	36.37	0.006
3	38.60	0.006
4	43.03	0.007
5	25.58	0.004
6	37.56	0.006
7	15.67	0.002
8	35.37	0.006
9	35.83	0.006
10	39.73	0.006
11	38.10	0.006
12	37.98	0.006
13	37.36	0.006
14	27.49	0.004
15	38.80	0.006
16	23.90	0.004
17	14.25	0.002
18	42.96	0.007
19	9.32	0.002
20	24.75	0.004
21	43.12	0.007
22	24.54	0.004
23	14.03	0.002
Mean		0.005

Table S4. The solar altitude angle (SAA) and proportion of shade surface of each sites at the MODIS passing time during daytime (10:30 local time) [1] of June Solstice, September Equinox and December Solstice.

PV power plant No.	Longitude (°)	Latitude (°) [2]	SAA (10:30, June Solstice)	SAA (10:30, September Equinox)	SAA (10:30, December Solstice)	L_{shade}/L (10:30, June Solstice)	L_{shade}/L (10:30, September Equinox)	L_{shade}/L (10:30, December Solstice)
1	100.54	36.13	66.80	48.28	26.75	0.31	0.65	1.45
2	95.15	36.37	66.69	48.08	26.53	0.32	0.66	1.48
3	102.12	38.60	65.59	46.24	24.48	0.36	0.77	1.75
4	93.63	43.03	63.00	42.50	20.38	0.48	1.02	2.51
5	-103.04	25.58	69.44	56.46	36.36	0.18	0.32	0.65
6	105.03	37.56	66.12	47.10	25.44	0.34	0.72	1.62
7	78.28	15.67	67.45	62.83	45.13	0.12	0.14	0.28
8	-120.03	35.37	67.14	48.90	27.45	0.30	0.62	1.37
9	-114.96	35.83	66.94	48.53	27.03	0.31	0.64	1.42
10	98.07	39.73	64.97	45.30	23.44	0.39	0.82	1.92
11	102.31	38.10	65.85	46.66	24.94	0.35	0.74	1.69
12	106.99	37.98	65.91	46.76	25.05	0.35	0.74	1.67
13	97.19	37.36	66.22	47.27	25.62	0.34	0.71	1.59
14	71.93	27.49	69.32	55.06	34.64	0.20	0.36	0.75
15	109.68	38.80	65.48	46.07	24.29	0.37	0.78	1.78
16	71.20	23.90	69.41	57.65	37.87	0.17	0.28	0.57
17	77.47	14.25	66.85	63.58	46.36	0.11	0.13	0.24
18	90.03	42.96	63.05	42.56	20.45	0.47	1.02	2.50
19	78.38	9.32	64.27	65.75	50.54	0.08	0.07	0.14
20	55.38	24.75	69.44	57.05	37.11	0.17	0.30	0.61
21	89.33	43.12	62.95	42.42	20.30	0.48	1.03	2.53
22	55.44	24.54	69.44	57.20	37.30	0.17	0.29	0.60
23	78.43	14.03	66.75	63.69	46.55	0.11	0.12	0.24
mean			66.488	51.56	31.04	0.28	0.56	1.28

[1] The solar altitude angle at 13:30 (local time) is equal to the solar altitude angle at 10:30 (local time)

[2] Tilt angle is equal to the latitude of the PV powerplant [74].